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BRITISH MEDICAL JOURNAL

LONDON SATURDAY DECEMBER 10 1960

ON THE NATURAL HISTORY OF FALLS IN OLD AGE*

BY

J. H. SHELDON, C.B.E., M.D., F.R.C.P.

Wolverhampton

The liability of old people to tumble and often to injure themselves is such a commonplace of experience that it has been tacitly accepted as an inevitable aspect of ageing, and thereby deprived of the exercise of curiosity. The literature, in fact, on what has always been a trial for the elderly and is now becoming a problem for the community is very meagre (Sheldon, 1948; Scott, 1954; Droller, 1955; Hobson and Pemberton, 1955; Howell, 1955; DeLargy, 1958; Boucher, 1959; Exton-Smith, 1959; Fine, 1959), and bears little relation to either the practical importance or the intrinsic interest of the subject. An essential preliminary to further investigation is a knowledge of what actually happens, and the present paper is an attempt to meet that need by an account of the natural history of these falls.

The inquiry was directed at old people living at home, since the hospital population of old age has a heavy pathological bias, and, in addition, faces postural risks different from those of the community at large. This paper presents the results of an inquiry into 500 falls which happened to 202 individuals—86 had been brought to the casualty department of the Royal Hospital, Wolverhampton, as the result of a fall, 59 had been admitted with a fractured femur, and the names of 57 were provided by the practitioners of the town. The inquiry was stopped when 500 falls had been described. This number is much less than the total falls sustained by these individuals, and reflects merely the number for which reliable information was available. Of the 168 persons seen at home, 34 were men and 134 women. The age distribution of the 202 was as follows: 50–59, 11; 60–64, 16; 65–69, 27; 70–74, 35; 75–79, 39; 80–84, 53; 85+, 21. The frequency of the condition, its association with increasing age, and the ease of obtaining contact with a large number of old people so affected are obvious.

It proved surprisingly easy to classify the 500 falls, though the categories are not entirely self-contained.

Accidental falls	171
Drop-attacks	125
Trips	53
Vertigo	37
Recognizable C.N.S. lesion	27
Head back	20
Postural hypotension	18
Weakness in leg	16
Falling out of bed or chair	10
Uncertain	23

The very small number of falls out of bed is remarkable, and is in immediate contrast with their predominant importance in the hospital population of old people (Fine, 1959), where the incidence of physical and, particularly, of mental defect is so much greater. The environment contributed a quota to the causation of 224 falls, whereas the cause lay within the old person in the remaining 276, though effective separation is difficult. Thus, while in some of the accidental falls a younger person would also have fallen, in many others balance would have been retained; for old people complain bitterly of inability to preserve their balance as they did when younger, saying, "Once you're going you've got to go"—a remark which reveals a considerable problem in defective physiology.

Accidental Falls

There were 171 falls (34% of total) in 125 individuals, as follows:

On stairs		63
Missing last step or steps	15	
Poor illumination	13	
Vertigo	12	
Various	23	
Slipping		49
Falling over unexpected objects		16
Dark		12
Various causes		31

One-third of falls sustained by old people living at home are accidental in origin, and are of importance in that they offer the main target for prevention. Stairs, in turn, account for one-third of the accidental falls, and the complete contrast between this fact and the small amount of time actually spent at risk is a measure of the great hazard that stairs present to old people. The most frequent cause lies in missing the last step or the last group of steps in the mistaken belief that the bottom has been reached. This happens to us all from time to time, but in earlier years we are almost invariably able to preserve our balance, even if with some difficulty, and it provides a good illustration of the difficulty experienced by the older person in preserving a balance suddenly placed in jeopardy. Not only did one-quarter of the falls arise in this way, but six of the 59 fractured femurs (10%) were in this group. The elimination of this particular hazard of the stairs is therefore a matter of urgency.

Next in importance comes inadequate illumination, whether the reason be defective vision or a fault in the actual lighting. In this respect the cellar steps and upstairs landings are especially apt to be at fault. Vertigo on the stairs accounted for 12 of the 63 falls. Some old people are apt to be giddy when looking down from the top of the stairs, but vertigo seems to be most dangerous when an individual is ascending, owing to the danger of falling backwards, with obvious risks of severe injury. There is need for improvement in the

*Abridged from a B.M.A. Lecture delivered to the Belfast Division on November 11, 1959. I wish to express my thanks to the Birmingham Regional Hospital Board for a grant in support of this work.

design of handrails for old people. Not only should they provide extra support at the top and bottom of the stairs, but the terminal shape of the rail should provide a special sensory cue which the hand will not normally reach till the feet have left the staircase at the bottom. A detached rail on both sides is ideal and should be of a size convenient for the sudden operation of the grasp reflex. The rail is often either so broad or so close to a wall that it is difficult for the hand to effect a sudden secure grasp in emergency. No fewer than 28 of the 63 falls on stairs might have been prevented by good handrails and adequate illumination, which in turn might have eliminated the further risk of the staircase, new to the old person, which was responsible for one-tenth of the falls on stairs.

Loss of balance on a slippery surface accounted for one-quarter of the accidental falls, and half of these (21 falls) were caused by ice or snow, the commonest mode being that of the old woman who slips on her doorstep or in the back yard after a frosty night. It was pointed out by Boucher (1959) that the death rate from falls in old age was at its highest in Scotland, and thence declined southwards from a figure of 2.854 women per million living to one of only 1,439 for the South of England. The frequency of falls on ice and snow would seem to offer a reasonable approach to this curious geographical difference in mortality.

In addition to the well-known risk of the mat on slippery linoleum, floors slippery from something spilt and rubber shoes on wet pavements were also a source of danger. The domestic risks entailed by objects on the floor in unexpected places (grandchildren and pet animals being mainly at fault) account for one-tenth of the accidental falls, and in many instances darkness or poor illumination was an important contributory factor. Indeed, the small number of accidents directly due to darkness (for example, a fall in a dark bedroom during the investigation of a noise because of suspicion of burglars) bears no relation to the importance of inadequate visual information as a hidden but potent cause of accidental falls. The effect reaches beyond actual avoidance of the incident: when balance is in sudden jeopardy the point of no return is reached much earlier in the old than in the young, and a deficit in visual signals may further impair this already narrowed margin of safety. The danger is often intensified by the simultaneous presence of postural hypotension, as in getting out of bed at night to pass urine. Under such circumstances, even the least visual aid, as by a nightlight, can be most helpful to old people.

Drop-attacks

One hundred and twenty-five of the falls, occurring in 58 individuals, were classified as drop-attacks. A similar incidence of one-quarter of all falls was found in the Wolverhampton survey of a random sample (Sheldon, 1948), and the confirmation of the important role of the drop-attack in the falls of old people is one of the main findings of the present investigation. They can be dealt with here in broad outline only.

In a typical attack the individual suddenly and without warning falls to the ground, and many such persons have emphasized that they were at their normal avocations and feeling in good health at the time. So unexpected and so sudden is the incident that there is no time to prevent or to break the fall. There is no loss of consciousness, though, particularly in more advanced years, the victims may be dazed by the shock of collision with the ground, and are sometimes so surprised that they burst into tears.

Case 1.—A woman of 86 was in her scullery peeling potatoes. She felt nothing wrong at all, but just fell down. She had actually peeled one potato and had picked up a second when the next moment she found herself on the floor, with a potato in one hand and the knife in the other.

They appear to fall under the unrestrained pull of gravity, and the speed of descent is such that injuries are common: in fact, 26 of the 58 old people concerned had sustained fractures or dislocations, while lesser injuries, particularly cut knees, are still more frequent. If not complicated by injury, the pattern of recovery varies in a curious way, being either immediate or delayed. These are about equally common, and are illustrated by the two following case reports.

Case 2.—A woman of 61 was walking to church with a friend on each side when, as she says, she suddenly found herself on the pavement. Her friends were so surprised that they exclaimed, "Whatever are you doing down there?" However, she got up quite easily and went on walking. She appears also to have had some partial drop-attacks, for she "had been down on her knees three or four times."

The pattern of recovery in the next case was quite different.

Case 3.—A woman of 66 set out to go into town to do some shopping. She was walking along quite normally when, without warning, she suddenly fell forwards on the pavement. (She was not giddy, and knows that she neither slipped nor tripped.) She was quite unable to get up (though uninjured) and she had to remain some minutes on the pavement until a man appeared, when she managed to raise an arm to attract his attention. He, however, was quite unable to lift her, and, going off for help, was lucky enough to return with expert assistance in the shape of two dustbin men. With the additional help of a housewife who had just appeared, the four people were able to get her on her feet again. She stood where she was for a minute or so, and then managed to walk the short distance home with the woman holding her arm.

Several points arise from this history.

(1) Difficulty of Getting Erect Again

The difficulty of getting her erect again typifies the common experience of the younger relatives in these situations. They all agree that the patients are a "dead-weight," and there is little doubt that the loss of power is associated with a loss of muscle tone—a flaccid state.

(2) Distribution of Loss of Muscle Power

The distribution of this loss is peculiar. It certainly affects the legs, and there is good evidence that the trunk muscles are affected. A very intelligent daughter stated that the main difficulty in getting her father, aged 84, on his feet after one of these attacks was that of lifting his trunk, for "he has no strength in the body." It will be noted that Cases 5 and 7 (see below) fell on their backs and were unable to turn over, although it is clear from the details that the arms were unaffected. That the arms normally escape in the typical senile drop-attack is shown by the following case report, which is typical of many.

Case 4.—A woman of 79 was walking across the hall when she "suddenly went down wallop." She had the greatest difficulty in getting up, but managed to drag herself across the floor, and then "hoisted herself up by the furniture."

The histories show a remarkable agreement on the retention of sufficient power in the victims' arms to

drag themselves across the floor and clamber up a suitable piece of furniture—while the legs and the rest of the trunk remain flaccid. It is suggested, therefore, that the drop-attack is caused by a sudden loss of tone limited to the anti-gravity muscles normally concerned in the maintenance of the upright position.

(3) Duration of Loss of Power

The loss of power may be prolonged and of sufficient duration to endanger life in an old person living alone.

Case 5.—A woman of 80 had made herself a cup of tea in the kitchen, and had put it on the table when "down she went." The kitchen clock registered 9.30 a.m. She fell on her back and could not get up until a neighbour came in at 5.30 p.m. She says the table moved whenever she tried to climb up it, and for the whole time she was unable to turn over on her face.

The duration of the loss of power for eight hours was cut short only by the timely arrival of help.

(4) Recovery of Function

We now come to what seems to me to be the most remarkable aspect of this whole series of events—that after, perhaps, some hours of effective paralysis, and after, perhaps, a considerable struggle to get the old person erect again—once there, immediate recovery of function occurs. In only one of the 125 falls did the individual fall down again after restoration of the upright position. Two case histories have provided a possible examination.

Case 6.—A woman of 72 "fell down flat" in her bedroom one night while going to bed. She was unable to get up herself, and her husband was also unsuccessful. She spent the night on the bedroom floor and was in some distress by the time the doctor was fetched next morning. He also found it impossible to lift her until he had moved her so that her feet pushed against the skirting-board of the room, when "he was able to lift her up from the back."

Case 7.—A woman of 86 was at the back of a large ground-floor room, when she suddenly fell down. She was unable to get up again and had to drag herself on her back across to the front of the room so that her feet could fall over two low steps into the garden path. She was then able to grasp some railings and stand erect.

In both these histories there is the strong suggestion that the decisive factor in recovery of function lay in pressure on the soles of the feet. This recalls the "magnet response" or "positive supporting reaction," which, according to Walsh (1957), is "obtained most readily in decerebrate animals that have been subjected to a removal of the cerebellum." In this state pressure on the soles of the feet causes extension of the limbs and tensing of the back muscles. The analogy with what happens to these old people is too close to be accidental, and it is suggested that it is by the operation of this low postural reflex that tone is restored to the anti-gravity muscles and the higher centres in the hind-brain are enabled to resume their normal control of posture and gait. This, if true, leads inevitably to speculation on the nature of a disturbance of central function that can cause such sudden and specialized loss of power and can then be restored to normal by the evocation of a lower reflex. One wonders whether the drop-attack may be based on a sudden loss of postural alertness—a sort of postural inhibition or sleep—based perhaps on a disturbance of function in the reticular substance of the brain-stem.

Provocative Factors

In 96 falls with a good history the falls occurred during the following states of movement: walking normally, 36; turning round, 25; standing, 14; beginning to move, 8; rising from sitting, 8; throwing the head back, 4; out of bed, 1. The one fall out of bed seems to have been a true drop-attack, and is of interest in that it may be relevant to the frequency of falls out of bed in the hospital population of old people.

Case 8.—A woman of 81 was just beginning to get out of bed when she "suddenly found herself on the floor." There was no giddiness. The recovery was typical, in that "she had great difficulty in getting up, and only managed this by dragging herself along the floor, and then up by the bed-rail."

The circumstances in which the attacks occurred are so various that they must either be irrelevant or contain a common factor. If this be the case, the movement of the head and neck which in that particular individual affects the blood-flow in the vertebral arteries would seem the most likely cause. Sharply delineated as are the clinical features of the drop-attack, the falls of those who suffer from it are by no means limited to this mode. Fifty one of the 58 individuals had had more than one fall; 32 had had other types of fall, while 19 had suffered from drop-attacks alone. Thus in almost two-thirds of the victims the drop-attack could be regarded as but one manifestation of a more general decrease of postural control.

Trips

Trips were responsible for 53 falls in 41 individuals. In fact, many more than this number were sustained, for, of all the modes of fall, that by tripping was easily the most apt to affect certain persons with special frequency and for the details of earlier falls to be forgotten. Indeed, some of the old people concerned had come to accept this liability to trip as part of their normal existence. It seems to be directly associated with age, for half of these subjects were in the 75–84 decade, and they all agreed (1) that they did not lift their feet as high as they used to, (2) that they found it almost impossible to recover their balance once they had begun to go, and (3) they were more likely to trip when tired or in a hurry. As would be expected, the most frequent single cause is the edge of rugs and carpets. ("I collect all the mats," said one old man of 84.) Kerbstones and steps in the house present a similar obstacle, and between them account for as many falls, while irregularities in the pavement are also a frequent stumbling-block. The underlying alteration in gait is obscure, but seems apt for experimental study. It may be part of the well-known gait of very old people, the "marche à petits pas," which, as Critchley (1931) has pointed out, so strongly suggests an extrapyramidal origin.

Falls Due to Vertigo

These amounted to only 37 falls in 26 individuals. This number—a mere 7% of the whole series—is surprisingly small, for popular belief ascribes all unexplained falls in old people to an attack of giddiness. The reason is undoubtedly that the development of an attack of vertigo is usually slow enough to allow of safety measures—as by sitting down or holding on to something. For this reason only 26 of the 45 persons in the whole sample who were liable to giddiness had

actually sustained falls, and in 20 of the 37 falls it was obvious that there would have been no fall had there been something handy to catch hold of.

This mode of falling is of special importance in late old age, for rather more than half the group (14 out of 26) were in the eighties. In some instances the subjective giddiness was accompanied by a sudden act of rapid, compulsive, and uncontrollable turning, which brought the old person at once to the ground. It has already been pointed out that the most dangerous of the falls due to vertigo are those that occur when an old person is going upstairs. The incidence of defective hearing and of tinnitus was almost double that found in the whole sample, figures of 58% for defective hearing and of 41% for tinnitus contrasting with 29% and 20%.

Falls Due to Disease of Central Nervous System

Twenty-seven falls occurred among 21 individuals. One-tenth of the sample were therefore concerned, and in some cases the number of falls was large, though an adequate history was available only for the last one or two. The conditions found were: subacute combined degeneration of the spinal cord, 3; paralysis agitans, 3; onset of cerebral thrombosis, 4; probable carotid or basilar artery thrombosis, 4; pre-existing hemiplegia, 7.

Falls Due to Throwing the Head Back

Twenty falls in 17 individuals were the direct consequence of looking upwards with the head thrown back, and in 17 of these 20 falls the old people were working with the hands above the head. Falls due to this cause may begin in late middle life, but they become increasingly characteristic of the later stages of old age: 10 of the 17 individuals were beyond the age of 75. Typical cases were:

Case 9.—A woman of 86 had been advised not to reach above her head, but nevertheless she went out to hang up some clothes on the line, and as she started to do so "at once went down with a wallop backwards."

Case 10.—A woman of 64 (who had had several drop-attacks) wanted to stitch a curtain at the top of a door and therefore stood on a stool while her husband held her. When she started to work above her head she was "seized at once with an attack of giddiness" and a "very queer feeling," so that her husband had to get her down. Had he not been there she would have had a nasty fall.

These falls carry a special risk of injury, for a common domestic reason for working with the head thrown back is to reach something high up in the room—such as an electric-light bulb—which may necessitate standing on a stepladder or a chair and so greatly reduces the security of stance. Many old people find that to retain balance with the head thrown back they need both to stand on a wide base and to hold on to something. When placed at sudden risk in this position old people are apt to clutch at whatever may be handiest, and so to bring some heavy object down on top of them.

Case 11.—A woman of 87 began to have falls if she put her head back and worked with her hands above her head. She had always kept her hats on the top shelf of a wardrobe, and in trying to reach them she pulled the wardrobe over on top of her on two occasions. On another occasion she brought down a heavy iron saucepan and narrowly escaped injury.

Many old people have discovered for themselves the dangers of this posture and never willingly adopt it. The factors that may be concerned are undoubtedly relevant to the whole problem of falls in old age.

Falls Due to Postural Hypotension

Only 18 of the 500 falls were the direct result of postural hypotension—that is, of rapidly standing erect. Twelve falls occurred in the bedroom and four on straightening up—a particular hazard of the elderly gardener. The small number of falls ascribed solely to this cause bears no relation to its great importance in the postural life of old people, for many of them consciously adapt their habits to cope with it. Like inadequate illumination, postural hypotension has great importance as a hidden ingredient in other types of fall—as anyone will realize who has watched the initial uncertainties of balance of many old people when starting to move immediately after rising to the erect position. Of the 202 persons in the sample, 29 (14%) complained of postural hypotension, and had sustained 72 falls of various kinds.

Other Types of Fall

Of the remaining types of fall, 16 occurring in 12 individuals were due to mechanical weakness in one leg, so that it was unable to meet an emergency such as that caused by stepping on a loose stone. These falls, in general, were due to factors carried over into old age from earlier years, such as loss of muscle from an attack of poliomyelitis or the effects of trauma. The relative infrequency of falls out of bed or a chair—10 falls in six individuals—is in striking contrast to their importance in the hospital population of old age. These falls, which are often based on mental confusion, are always of serious import and apt to be terminal features. Finally, 23 falls in 21 individuals remained unexplained—a surprisingly small number.

Discussion

To venture beyond clinical description is at the moment hardly more than an adventure in speculation, for the clinical is almost the only evidence available. Nevertheless, the population of old people liable to falls seem to possess characteristics of much interest.

Defects of Function.—The incidence of defective hearing, tinnitus, and vertigo was identical with that found in the Wolverhampton random sample of 1948 (Sheldon, 1948), which suggests that these defects of function have no bearing on the general liability to fall. Droller (1955) confirmed this for vertigo in the Sheffield survey; for the incidence of fractures in old women was the same in those with and without vertigo.

Loss of Vibration Sense in the Legs.—This was found in 22 of 62 patients examined (35%), which is somewhat higher than the figure of 25% found in the Sheffield survey (Hobson and Pemberton, 1955). This is a well-known phenomenon of ageing, but it is unlikely to be of relevance here in view of Droller's (1955) analysis of the Sheffield figures, which showed that the incidence in those who fell was only 15.9%, as compared with 30.6% for the remainder of the sample.

Plantar Responses.—Of the 81 individuals examined 18 (22.3%) had abnormal plantar responses. These were absent in 2, extensor in 7, and equivocal in 9—the abnormalities being bilateral in 13 and unilateral in 5. The series is confined to those with no other evidence of pyramidal-tract defect. Howell (1949) found abnormal plantar responses in 5% of Chelsea Pensioners. In the

Sheffield survey (Hobson and Pemberton, 1955), after subjects with hemiplegia had been excluded, a similar figure of 5% was also found. The findings in the present sample suggest that abnormal plantar responses—without other evidence of pyramidal-tract damage—may be some four times as frequent as in the general old-age population. This confirms the findings of Droller (1955), who found in the random Sheffield sample that an extensor response was four times more frequent in those men who fell than in the rest (24%/6%); and in women it was almost twice more frequent in those who fell than in the rest (11.6%/7.5%). There is therefore good evidence that old people liable to fall have an incidence of abnormal plantar responses considerably in excess of that present in a random sample of old age.

Stability of Posture.—Stability of the erect posture was examined by Romberg's test in 65 individuals. In 16 (24%) there was a severe degree of Rombergism, the subjects being quite unable to remain erect with eyes closed, even when standing on a wide base; in 21 (32%) there was a moderate degree of Rombergism—with eyes shut the subjects maintaining a normal stance when on a wide base, but developing excessive sway with the feet together; in the remaining 29 individuals (44%) there was no Rombergism, balance being quite normal. More than half of the subjects tested, therefore, had a defective control of balance. No normal findings are available for comparison, but general experience would suggest that this incidence is much higher than the average incidence for the old-age population. It [illegible] a bearing on a severe deterioration of gait, which was present in 24 individuals. With an attitude of general flexion they walk with everted feet on a wide base, while holding on at the same time to the furniture or walls for further support. It is a truly senile gait, for of the 24 subjects concerned 23 were over the age of 70 and 18 were over 80.

Case 12.—A woman of 81—subject to innumerable drop-attacks—says she uses a stick to get about the house and holds on to anything near her hands for support—and it takes her a very long time to move around. To get out of her living-room she first holds on to the table, then to a chair, and then pulls on an old coat of her husband's which she keeps specially behind the door—while she opens the door and goes down one step into the kitchen; and so on.

Inability to Throw the Head Backwards Without Unpleasant Symptoms.—This was found in 41 of 81 individuals in the sample (50%), and in 16 of 27 (60%) of those subject to drop attacks—figures which are almost certainly much higher than in the general old-age population. The effects vary from a feeling of giddiness to a "very curious" or "very unpleasant" feeling, or to an immediate fall. It is unlikely that symptoms so immediate and so unpleasant result from the extra acrobatic skill necessary to preserve balance in this position; it is far more likely that the effective factor lies in the influence this position may exert on the patency of the vertebral arteries. Hutchinson and Yates have shown (1956) that the vertebral artery is particularly apt to be kinked by coexisting osteoarthritis of the cervical spine; and, since this is extremely frequent in old age, it is suggested that in the old people concerned the movement of the cervical spine involved in throwing the head back and looking upwards leads to kinking of one or both vertebral arteries, with resultant effects on the blood supply to the hind-brain. That this is likely to be the real explanation is borne out by the following remarkable case.

Case 13.—A woman of 57 says that she gets giddy if she holds her head back, and for this reason if she wishes to work at anything above her head she has to get her husband to steady her, especially if she is on steps. She added, however, that if she was by herself and really wanted to hold her head back, she could do it all right, but "it took her a little time to arrange her neck." Presumably the twisting movements of the neck that she used to illustrate this manœuvre were successful in freeing a portion of the vertebral artery that had been nipped by the extension of the neck.

Blood-pressure.—This was taken in 108 cases. The average figure for 22 men was 165/98, and for 86 women 182/103. These are in close agreement with the Sheffield findings (Hobson and Pemberton, 1955), and there is certainly no special incidence of hypertension in old people liable to fall. No information is available on whether changes in circulatory dynamics occur with any greater frequency than in the general old-age population.

Sex and Age Incidence.—The sex incidence shows a marked preponderance of women. The female incidence in the present sample is overweighted by the greater liability of women to fractures, but in the Wolverhampton random sample (Sheldon, 1948) 21% of the men were affected, as compared with 43% of the women. The steadily increasing incidence with age has already been pointed out. To sum up, the evidence suggests that old people liable to fall may differ from the general old-age population in the following ways: an increase in numbers with advancing age; a preponderance of women; and a greater incidence of pyramidal-tract damage, of defective control of posture, of associated abnormal gait, and of inability to throw the head back without symptoms.

Conclusions

On the whole, the evidence suggests that the different modes of fall are varying manifestations of a more fundamental defect in the control of posture and gait. The weight of evidence strongly suggests that this defect is central and that possible peripheral factors, such as muscular wasting or sensory defect, are unlikely to play more than an adjuvant role, so that the structural basis of the clinical picture is to be sought in the areas concerned in the central control of gait and posture, particularly the brain-stem and cerebellum. Evidence is available from other sources which supports this view and also incorporates the age factor, for, beyond any doubt, there is a fundamental relation between advancing years and increasing liability to fall.

It is well known that ageing is accompanied by a loss of nerve cells from the brain, and Bourne (1956) has summarized the numerical evidence of the rate of disappearance of Purkinje cells from the cerebellum with age. Not only does this reveal a severe neurocellular deficit in advanced age, but, in addition, special staining indicates loss of enzyme activity of the remaining cells. It is suggested, therefore, that the fundamental factor underlying the senile liability to fall is a decrease in the number of healthy nerve cells available for the control of posture and gait. Certain difficulties of movement which are common in old age become easier to understand on this basis: these are the difficulty in recovering balance once it has begun to be lost, and the way in which many old people have almost to think out an unusual movement before starting to execute it—as if the small number of cells available made it

necessary to lay down the sequences of movement in advance.

It is not known whether this neurocellular atrophy is a direct result of the ageing process or whether it is based on ischaemia. Biemond (1951) found disappearance of Purkinje cells as a minimal result in some cases of basilar artery thrombosis, and suggested that "slight interference with the circulation in the cerebellum may lead to a local and perhaps also a more diffuse disappearance of the Purkinje cells." These observations are particularly relevant in view of the fact that no less than 50% of the whole sample and 60% of those having drop-attacks were unable to throw their head back without immediate symptoms. Reasons have already been adduced for the view that this is based on temporary obstruction to one or both vertebral arteries facilitated by senile cervical osteoarthritis, and it fits in well with Kremer's (1958) suggestion that drop-attacks are based on transient changes in the blood-supply to the brain-stem. Relative ischaemia in the territory supplied by the vertebral and basilar arteries might also underlie the high incidence of abnormal plantar responses, and much of the vertigo of which old people complain so bitterly may have the same origin.

It is suggested, therefore, that the general insecurity of postural control and the liability to fall which are characteristic of old age are based ultimately on a decline in the number of nerve cells in the brain-stem, cerebellum, and other centres—below that available for the maintenance of normal postural function in earlier life. The adverse effects of this cellular poverty will inevitably be accentuated by interference with the blood supply to the region which, in two ways, is particularly apt to happen in old age—by the liability of the vertebral arteries to temporary obstruction and the general proneness to phases of hypotension based on postural and other causes. Many intriguing problems remain; the drop-attack remains a remarkable event—from its instantaneous onset to its apparent path of recovery in some cases by the initiation, through pressure on the soles of the feet, of a reflex which seems hitherto to have belonged more to the province of neurophysiology than of clinical medicine. Therein, however, lies one of the fascinations of old age as a clinical study, for these phenomena have been uncovered because at this stage of life Nature resembles the engineer who may release the unexpected when he tests his materials to destruction.

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SEROLOGICAL RESPONSES AND CLINICAL REACTIONS TO INFLUENZA VIRUS VACCINES*

BY

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In 1956–8 the Medical Research Council Committee on Influenza and Other Respiratory Virus Vaccines carried out a serological trial with oil-adjuvant vaccines of various viscosities, and in 1958–9 a trial with vaccines admixed with different amounts of aluminium phosphate.

In planning the 1956–8 trial, consideration was given to the fact that in past trials the very efficacious oil-adjuvant vaccines produced severe local reaction in a small number of individuals (Philip *et al.*, 1954; M.R.C., 1955, 1957). It was thought that, apart from purely chemical factors, the degree of viscosity of the vaccines, or possible physico-chemical changes arising during storage, might play a part in the aetiology of these reactions. However, before attempting to discover the influence of these factors on reaction rates in a large-scale trial, it was decided to study, with small groups of volunteers, the serological responses to fresh emulsified vaccines of different viscosities and to the same vaccines after storage.

In detail, the object of the trial was then: (1) To compare the serological responses, and as far as possible to observe clinical reactions, to three oil-adjuvant influenza virus vaccines which differed only in viscosity, and to compare these responses with the response to a saline vaccine containing the same quantity of antigen. (2) To assess serologically and by clinical observation the keeping properties of these three oil-adjuvant vaccines after storage for four weeks at 4° C.

The purpose of the 1958–9 trial was to examine, in view of a slight risk of provoking poliomyelitis especially in children, the value of aluminium phosphate in saline influenza virus vaccines. In all the earlier trials of saline vaccines which have been organized by the Committee aluminium phosphate was a component of the vaccines. It was thought that aluminium phosphate had possibly an adjuvant effect in man and that this substance was, at least in part, responsible for the low rate of both the local and the general reactions observed with aluminium-phosphate-adsorbed vaccines.

To ascertain the validity of these suppositions, it was decided: (1) To study in a serological trial, with small groups of volunteers, the comparative adjuvant effect, if any, of 10 mg., 5 mg., and 2.5 mg. of aluminium phosphate per dose of influenza virus vaccine, using as a control a vaccine without aluminium phosphate but containing the same quantity of antigen. (2) To compare the clinical reactions to these four vaccines in somewhat larger groups of volunteers.

Vaccines

The vaccines used in both trials were prepared at the Wright–Fleming Institute by methods described

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previously (M.R.C., 1957) with, however, some modifications. One new technical feature was the use of an emulsifying machine specially developed for the preparation of oil-adjuvant vaccines.† The need for an apparatus that would bring about the complete emulsification of the vaccine components under sterile conditions and permit the production of emulsions, of predetermined viscosities, in the small quantities suitable for experimentation, arose from the fact that neither syringes, which were used hitherto, nor commercially available homogenizers met these requirements fully. Essentially, the emulsifier (Fig. 1), which is based on a well-known principle, is an electrically driven geared

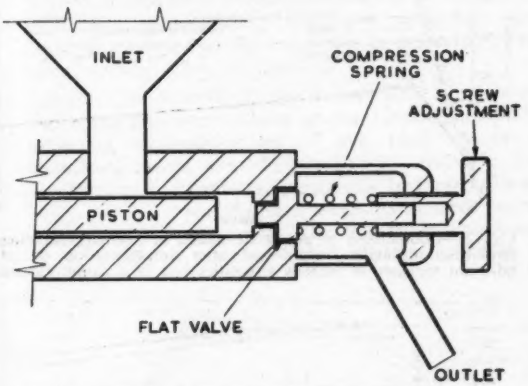

FIG. 1.—Diagram of the head of the emulsifying apparatus.

pump made of stainless steel. A reciprocating piston in the horizontal chamber of the pump forces the premixed component fluids of the vaccine through an aperture formed when the flat-headed outlet valve is lifted from its seating. The valve itself is controlled by a compression spring, the tension of which can be adjusted by a graduated control knob. The degree of tension of the spring determines the effective size of the aperture, and hence the viscosity of the emulsion.

The premixing of the fluids takes place in a conical glass funnel—which is provided with a stopcock and connected vertically to the chamber of the pump—by means of an electrically driven perforated stainless-steel stirrer. With the stopcock closed, a measured volume of a mixture of nine parts of a light mineral oil and one part of "arlacel A" (the emulsifying agent) is poured into the funnel. Then, with the stirrer set in motion, an equal volume of a virus suspension is added slowly to the fluid in the funnel. After thorough mixing, the stopcock is opened and the evenly turbid mixture flows into the horizontal chamber of the emulsifier. When the piston moves forward it closes the outlet of the funnel into the chamber, and then forces the mixture, now trapped in the chamber, through the outlet valve. On the return stroke of the piston the chamber refills when the piston has moved back far enough to allow the mixture to flow in again from the funnel.

The following vaccines were prepared for the serological trial of 1956–8:

Vaccine S.—A saline vaccine prepared from the A/England/211/56 strain of influenza virus A. It contained 2,000 haemagglutinating units of virus and 10 mg. of aluminium phosphate per dose (1 ml.).

†The apparatus was made by, and is available from, T. Giusti and Son Limited, 210/212 York Way, London N.7.

Vaccine Eh.—A water-in-oil emulsion of high viscosity, containing 2,000 haemagglutinating units of A/England/211/56 virus per dose (0.25 ml.).

Vaccine Em.—A water-in-oil emulsion of medium viscosity, containing 2,000 haemagglutinating units of A/England/211/56 virus per dose (0.25 ml.).

Vaccine El.—A water-in-oil emulsion of low viscosity, containing 2,000 haemagglutinating units of A/England/211/56 virus per dose (0.25 ml.).

Vaccine Eh'.—The same as vaccine Eh, but stored for one month at 4° C.

Vaccine Em'.—The same as vaccine Em, but stored for one month at 4° C.

Vaccine El'.—The same as vaccine El, but stored for one month at 4° C.

Because of favourable reports received from the U.S.A., the mineral oil "drakaol No. 6" was used instead of "bayol F" in the preparation of the emulsified vaccines. Supplies of this oil and of purified arlacel A were obtained from the U.S.A. by the Medical Research Council. The "high," "medium," and "low" viscosities of the emulsions resembled the viscosity of treacle, heavy mineral oil, and fairly light mineral oil respectively. After centrifuging for 10 minutes at 2,000 r.p.m., none of the emulsified vaccines showed any continuous aqueous phase, but some free oil was present in all of them, corresponding in amount to the viscosity of the emulsions—the lower the viscosity the greater the amount of free oil. There were no signs of breakdown in the stored emulsified vaccines.

For the serological trial of 1958–9, the following vaccines were made:

Vaccine A.—A saline vaccine prepared from the Asian strain A/Singapore/1/57. It contained 20,000 haemagglutinating units of virus and 10 mg. of aluminium phosphate per dose (1 ml.).

Vaccine B.—A saline vaccine prepared from the Asian strain A/Singapore/1/57. It contained 20,000 haemagglutinating units of virus and 5 mg. of aluminium phosphate per dose (1 ml.).

Vaccine C.—A saline vaccine prepared from the Asian strain A/Singapore/1/57. It contained 20,000 haemagglutinating units of virus and 2.5 mg. of aluminium phosphate per dose (1 ml.).

Vaccine D.—A saline (control) vaccine prepared from the Asian strain A/Singapore/1/57. It contained 20,000 haemagglutinating units of virus (but no aluminium phosphate) per dose (1 ml.).

The virus suspension used in the preparation of these vaccines, like that in the 1956–8 trial, was highly purified by the differential centrifugation of extracts of the deposits recovered after centrifuging infective allantoic fluids. The final preparation was the supernatant suspension obtained after centrifuging the penultimate preparation for 10 minutes at 8,000 r.p.m. in a Spinco centrifuge.

Serological Procedures

All the pre- and post-inoculation sera of both trials were tested, at the Wright-Fleming Institute, for the presence of haemagglutination-inhibiting antibodies. To obtain independent confirmation, a small number of sera, chosen at random, were also examined at the World Influenza Centre, Mill Hill, or in the Virus Research Laboratory of the University of Sheffield. The results of these investigations were in agreement with those obtained at the Wright-Fleming Institute. The A/England/211/56 virus antigen for the inhibition tests of the sera from the 1956–8 trial was prepared

from the same seed virus used in the manufacture of the vaccines for the trial. This strain was not found to be affected by non-specific inhibitors. The Asian strain A/Singapore/1/57 which was incorporated in the vaccines for the 1958–9 trial proved, however, to be highly sensitive to non-specific inhibitors.

To obviate the necessity of treating the many sera of this trial with *Vibrio cholerae* filtrate to destroy these inhibitors, an Asian strain devoid of such sensitivity was obtained from the Central Public Health Laboratory, Colindale. This strain, which had been isolated from a Pakistani seaman in 1957, was not inhibited by human sera obtained before 1957. It indicated Asian antibodies, however, to almost the same titre as the A/Singapore/1/57 strain, in sera obtained in the 1958–9 trial that had been treated with *Vibrio cholerae* filtrate. When, instead of fowl cells, 0.5% human O cells were used in the test, the indicating properties of the Pakistani strain equalled those of the A/Singapore/1/57 strain. The use of human cells, because of their smaller size, less streamlined shape, and possible lower density, prolongs the usual reading-time of titrations from one to one-and-a-half hours. However, by using as a diluent 0.62% lithium chloride in M/100 phosphate buffer solution of *p*H 7 – 7.2, instead of the usual 0.85% sodium chloride solution buffered in the same way, it was found possible to overcome this drawback and to obtain, with human cells, patterns which permitted the determination of well-defined end-points after one hour.

Because of the lower density of the 0.62% lithium chloride solution, which is, by calculation, osmotically closely equivalent to 0.85% sodium chloride solution, various types of red cells were found in sediment in approximately two-thirds the time taken in the physiological saline. No untoward effects on haemagglutination by influenza viruses or on inhibition of haemagglutination by antibodies were observed with the lithium chloride solution. Occasionally, slipping of cells occurred in inhibition tests with this solution as it does with physiological saline. This was obviated, in repeat tests, by adding 0.1% bovine albumin (Armour) to the diluent. The physiological and physical properties of the lithium chloride solution suggest that its wider use in experimental and clinical pathology might prove advantageous.

In addition to the inhibition tests, complement-fixation tests were carried out at the Wright–Fleming Institute on all sera from the 1958–9 trial. A stock of particle antigen for the tests was prepared from a pool of allantoic fluid, infected with A/Singapore/1/57 strain, by differential centrifugation.

1956–8 Trial

Organization.—This trial was carried out in two parts. For both parts volunteers were recruited from the medical and nursing staffs of 11 mental hospitals in the Metropolitan and Epsom areas. In part I, volunteers, selected at random, were inoculated with the saline vaccine S or one of the emulsified vaccines Eh, Em, and El, in December, 1956. In part II, the emulsified vaccines, Eh′, Em′, or El′, were given four weeks later to other volunteers, similarly selected. Vaccine S was given by deep subcutaneous inoculation into the left upper arm; all other vaccines were injected deeply into the left triceps. In all, over 300 volunteers received vaccines, but only from 253 of them was it found possible to obtain complete sets of blood samples. These were taken before inoculation and then after six weeks, three months, six months, and one year. All volunteers were examined for reactions 48 hours after inoculation and on the days when the post-inoculation blood samples were taken.

Serological Results.—The geometric-mean antibody responses to the vaccines in parts I and II of the trial are depicted graphically in Figs. 2 and 3. It will be

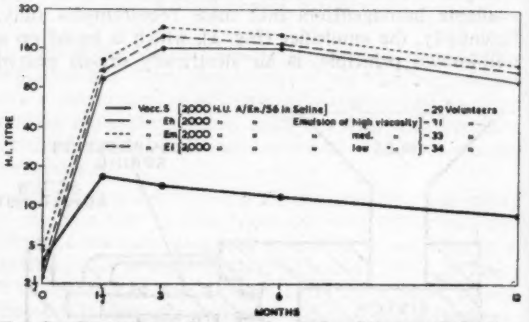

FIG. 2.—Comparison of geometric means of haemagglutination-inhibiting antibodies before and after administration of oil-adjuvant vaccines of various viscosities and of a saline vaccine.

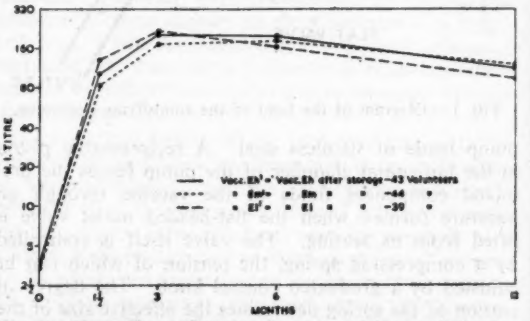

FIG. 3.—Comparison of geometric means of haemagglutination-inhibiting antibodies before and after administration of the oil-adjuvant vaccines referred to in Fig. 2, after storage for one month at 4° C.

noted that all emulsified vaccines evoked higher and more sustained antibody levels than the saline vaccine. This finding confirms previous observations (Salk *et al.*, 1952; M.R.C., 1955, 1957) on the adjuvant effect of a mineral oil in conjuction with arlacel A on the antigenicity of influenza virus antigens. It will also be seen from the graphs that the emulsified vaccines, when compared with each other individually or in the sets of three, produced very similar antibody responses. From these results the conclusions may be drawn (1) that the different degrees of viscosity of the three oil-adjuvant vaccines had no influence on their antigenicity, and (2) that these vaccines, when stored for one month at 4° C., did not lose potency.

Reactions.—Neither immediate nor delayed local reactions were observed in the volunteers who received the emulsified vaccines. The saline vaccine produced in a few cases mild, transitory, local reactions. There were no general reactions with any of the vaccines.

1958–9 Trial

Organization.—This trial was conducted with the co-operation of Surgeon Captain S. H. R. Price, R.N.,

principal medical officer of H.M.S. *Collingwood*, who, in October, 1958, arranged for 400 volunteers to be inoculated at random with vaccines A, B, C, and D. 85% of the volunteers were 18-25 years old; the remainder were over 35. All vaccines were given by deep subcutaneous inoculation. From approximately 40 members of each group of 100 volunteers who received one of the vaccines, blood samples were taken immediately before inoculation, and three weeks and three months after inoculation. A record sheet was kept for each volunteer, in which details of local and general reactions, if any, were entered. Each volunteer was examined for reactions after 24 and 48 hours, and further examinations were carried out at the end of the third week and third month after inoculation. To obtain uniformity of assessment the naval authorities were asked to arrange that the volunteers be inspected by the same medical officer throughout.

Serological Results.—It can be seen from Fig. 4, which shows the geometric means of the haemagglutination-inhibiting antibody titres of the four groups of volunteers before and after inoculation with the four vaccines, that aluminium phosphate had no adjuvant effect on the three vaccines which contained various amounts of that substance. This finding was confirmed by the results of the complement-fixation tests (Fig. 5).

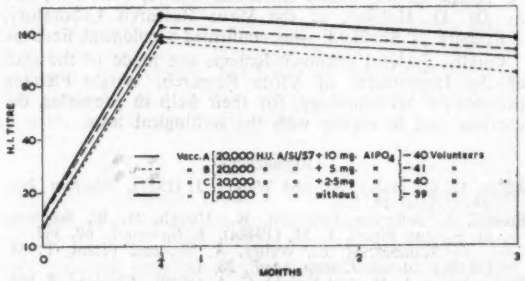

FIG. 4.—Comparison of geometric means of haemagglutination-inhibiting antibodies before and after administration of vaccines containing different amounts of $AlPO_4$ and of a control vaccine.

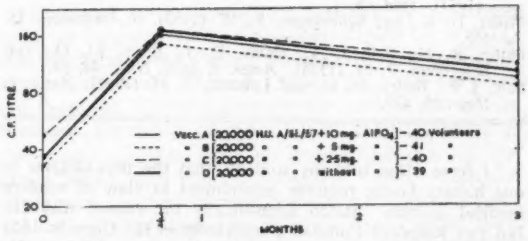

FIG. 5.—Comparison of geometric means of complement-fixing antibodies before and after administration of the vaccines referred to in Fig. 4.

Thus both tests showed that there was no difference between the antibody-evoking properties of the four vaccines.

Reactions.—The Table shows that only a few local and general reactions occurred in the four volunteer groups and that the slight differences between the groups are of little significance. It is clear that, at least under the conditions of this particular trial, aluminium phosphate could not be shown to reduce the small reaction rates.

Summary of Reactions to Three Influenza Virus Vaccines Containing Different Amounts of Aluminium Phosphate and to a Control Vaccine

Volunteers		Vaccine	$AlPO_4$ mg. Dose	Local Reactions				General Reactions			
No.	Age			Slight	Moderate	Severe	Total	Slight	Moderate	Severe	Total
87	18–25	A	10	1	—	—	1	—	—	1	1
86		B	5	5	—	1	6	2	2	—	4
85		C	2·5	1	—	—	1	—	—	—	—
85		D	0	3	—	—	3	—	—	—	—
13	35+	A	10	2	1	—	3	1	2	—	3
14		B	5	—	—	—	—	—	—	—	—
15		C	2·5	—	—	—	—	—	—	—	—
15		D	0	—	—	—	—	—	—	—	—
100	All ages	A	10	3	1	—	4	1	2	1	4
100		B	5	5	1	—	6	2	2	—	4
100		C	2·5	1	—	—	1	—	—	—	—
100		D	0	3	—	—	3	—	—	—	—

Discussion

The results of both serological trials show that, while aluminium phosphate had no adjuvant effect on the antigenicity of influenza virus vaccines, the adjuvant mixture introduced by Freund *et al.* (1948a, 1948b) produced this effect to an impressive extent. The production of occasional severe local reactions, in the form of sterile abscesses, by this mixture is still the only contraindication to its wide-scale introduction as an adjuvant to vaccines in this country. The 1956–8 trial aimed at identifying a possible factor in the causation of such abscesses. It is conceivable that too viscous an emulsion may, by virtue of its enhanced foreign-body-like action, promote the formation of abscesses in especially sensitive individuals. The groups in the 1956–8 trial to whom emulsified vaccines of different viscosities were given were too small to provide an answer to this question. The serological results, however, permit the conclusion that, provided vaccines are well emulsified, those of low viscosity are as potent as highly viscous ones. It is hoped that in future trials this finding may lead to further tests.

The observation that well-emulsified vaccines show good keeping properties after storage for one month at 4° C. is of practical value because, if the necessity for large-scale production of emulsified vaccine should arise, the problem of lengthy storage before and after distribution of such vaccines should not prove insuperable.

That aluminium phosphate had no adjuvant effect in the volunteers, though it had this effect in mice (unpublished observation), is perhaps to be explained by the fact that it is more irritating to the tissues of the mouse than to those of man. After the subcutaneous injection of influenza vaccines that contained aluminium phosphate, many of the mice developed small sterile abscesses at the site of the injection. However, the mice received, per unit of body-weight, much larger amounts of aluminium phosphate, and this circumstance has therefore also to be taken into account when assessing the relative merits of aluminium phosphate as an adjuvant to influenza vaccines. Further, one must bear in mind that concentrated preparations of only one particular virus antigen were under investigation in the 1958–9 trial, and that the conditions for demonstrating an adjuvant effect of aluminium phosphate in man might perhaps be more favourable with vaccines pre-

pared from other strains, or with vaccines containing smaller amounts of antigen.

Equally interesting was the finding that aluminium phosphate did not reduce the reaction rate in the groups of volunteers who received vaccines containing that substance. The point has already been made that the reaction rates in all groups were very low. It is probable that aluminum-phosphate-adsorbed vaccines show low reaction rates not because of the presence of aluminium phosphate in the vaccines but because of the purity brought about by the use of this substance in their manufacture. Aluminium phosphate was introduced in the preparation of vaccines during the last war, when high-speed centrifuges were not available to me, on observing that it absorbs, rapidly and almost completely and specifically, many influenza A viruses from infective allantoic fluids at *p*H 6.5 (*cf.* M.R.C., 1953; Miller and Schlesinger, 1955; Burke *et al.*, 1957; Frommhagen and Knight, 1959). The resulting stable complexes are easily handled during the ensuing purification by low-speed centrifugation.

Because of the removal of most of the extraneous protein, aluminum-phosphate-adsorbed vaccines are relatively very pure. Thus it came about that the low reaction rates after the administration of a number of such vaccines were attributed to the presence of aluminium phosphate. It is now evident from the results of the 1958–9 trial that at least an A/Singapore/1/57 virus antigen, if highly purified by differential centrifugation, does not require the admixture of aluminium phosphate to exhibit benign properties. Such properties may, however, indicate a low toxicity of this particular strain, and it is therefore possible that antigens prepared from more toxic strains—even if very pure—might prove to be far less innocuous unless aluminium phosphate were present in the vaccines. Nevertheless, in view of a slight risk of provoking poliomyelitis by the use of a prophylactic that contains aluminium phosphate (M.R.C., 1956), it seems advisable, for the time being, not to incorporate aluminium phosphate in influenza virus vaccines that have been adequately purified by other means.

Summary

The Medical Research Council Committee on Influenza and Other Respiratory Virus Vaccines carried out a trial in 1956–8, with 253 volunteers, to compare the serological responses and clinical reactions to three oil-adjuvant influenza virus vaccines of various viscosities, both before and after storage, and to compare these responses with those to a saline influenza virus vaccine.

The results showed (1) that the emulsified vaccines (confirming earlier observations) evoked greater and more prolonged antibody responses than the saline vaccine containing the same quantity of antigen; (2) that the viscosity of the emulsified vaccines had no influence on their antigenicity; (3) that storage of the emulsified vaccines for one month at 4° C. did not adversely affect their potency; and (4) that the emulsified vaccines caused neither local nor general reactions, in contrast to the saline vaccine, which in a few cases produced mild local reactions.

In a trial in 1958–9, three saline influenza virus vaccines, containing different amounts of aluminium phosphate, and a control influenza virus vaccine were given each to 100 volunteers to determine whether aluminium phosphate reduced the reaction rate. The pre- and post-inoculation sera of approximately 40 volunteers from each group were tested for antibodies to study a possible adjuvant effect of aluminium phosphate.

It was found (1) that the presence of aluminium phosphate in the vaccines had no influence on the small reaction rates, and (2) that aluminium phosphate exerted no adjuvant effect on their antigenicity.

The conclusions arrived at in the discussion of these results were (1) that there might be an advantage in using emulsified influenza virus vaccines of low viscosity, and (2) that, provisionally, aluminium phosphate should not be added to already purified influenza virus vaccines.

A great debt of gratitude is owed to the former secretary of the committee, Brigadier A. E. Richmond, and to the many who have co-operated in organizing the two trials. Acknowledgments for help in obtaining volunteers, making arrangements for inoculations, or collecting blood samples are due, in particular, to the medical superintendents of 11 mental hospitals of the South-West Metropolitan Region; to Dr. I. H. Maclean, consultant bacteriologist to the Mental Hospitals' Group Laboratory, West Park Hospital, Epsom; and to Surgeon Captain S. H. R. Price.

The co-operation of the many volunteers has to be recorded with much gratitude; their participation was a *sine qua non* for the trials.

Especially appreciated, too, was the help given by Dr. A. Isaacs, of the World Influenza Centre, Mill Hill, and by Dr. D. Hobson, of the Virus Research Laboratory, University of Sheffield, who confirmed serological findings.

Finally, grateful acknowledgments are made to the staff of the Department of Virus Research, Wright–Fleming Institute of Microbiology, for their help in preparing the vaccines and in coping with the serological tests.

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"I have often told my students that the first chapter in our history books requires amendment in view of modern medical science. Stated scientifically the reason why Dr. Jan van Riebeeck founded a settlement at the Cape in 1652 was that vitamin C has such poor keeping qualities. He could not have put it quite like that, of course. But he and his employer, the Dutch East India Company, knew that scurvy, which caused such a high morbidity and mortality among the sailors during their long voyage around the Cape on the way to the East, could be cured and even prevented by a diet of fresh vegetables and fruit. They knew that the food they loaded up before they left Holland gradually lost some quality which was necessary to prevent the onset of scurvy. By the time they reached the Cape all the crew were suffering in varying degree from this disease. To proceed further without a supply of fresh food meant the death of many." (Professor E. H. Cluver, South African Institute of Public Health's *Special Sixtieth Anniversary Brochure, 1900–1960.*)

THE RELATIVE ANTIBACTERIAL ACTIVITY OF FOUR PENICILLINS

BY

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When an antibiotic with important new properties is discovered it is apt to be introduced into clinical use before the full range of its antibacterial activity has been ascertained. This is particularly true of penicillins, because it has sometimes been assumed that their action is identical, or nearly so, with that of penicillin G. Phenoxymethylpenicillin (penicillin V) was not only introduced but widely used for six years before this assumption was shown to be incorrect (Garrod, 1960a); phenethicillin (alpha-phenoxyethylpenicillin; "broxil"), introduced as another acid-resistant penicillin, which is better-absorbed than penicillin V, shows similar differences.

An extension of these observations is reported here: they are extended by including both more bacterial species and another penicillin, 6-(2,6-dimethoxybenzamido)penicillanate monohydrate (BRL 1241; "celbenin"), the outstanding property of which is resistance to staphylococcal penicillinase. Information about the activity of this penicillin against bacteria other than staphylococci is given by Knox (1960) and by Rolinson *et al.* (1960), but some of this refers only to single strains, and in the second of these studies no comparison was made with other penicillins.

Methods

The plate dilution method with twofold differences was used as in the earlier study. Blood or heated blood was included for species requiring it. All strains used were recently isolated in this department except those of *Corynebacterium diphtheriae, Bacillus anthracis, Salmonella* spp., and some of *Proteus morgani*, which were stock cultures.

Results

The results are presented in a detailed but condensed form, as recommended in a Report (1960) of W.H.O., in the accompanying Table. The majority are as already reported elsewhere (Garrod, 1960b), but some are new, and those for *Neisseria gonorrhoeae* refer to a fresh set of strains, the earlier ones not having been preserved.

Staphylococci.—It must be emphasized that all the strains tested were penicillin-sensitive. Had a separate category of resistant (penicillinase-forming) strains been included, the findings for celbenin would have been the same, but the concentrations of other penicillins required to inhibit their growth would have been greater, the degree of difference depending largely on the size of the inoculum, although, owing to differences in the rate of inactivation by penicillinase, the order of their activity would have been broxil>penicillin V>penicillin G. Because of the effect of inoculum size, absolute figures, although frequently quoted, seem meaningless in this connexion.

Streptococci.—The descending order of activity of the four penicillins against all species of streptococcus studied (*Str. viridans* was omitted as being too variable in its characters) is the order of their discovery, the usual differences being 2-, 4-, and 16-fold.

Neisseria spp.—Penicillin G has four times the activity of penicillin V against the gonococcus, and the newer penicillins are rather less active still. Meningococci behave similarly.

Gram-negative Bacilli.—Only the less highly resistant species were examined: it seems improbable that *Aerobacter* and *Pseudomonas* spp., which are very resistant to penicillin G, would be any less so to others. The diminution in activity with later discovery is more

Minimum Inhibitory Concentration of Four Penicillins for Different Species of Pathogenic Bacteria*

	No. of Strains	Penicillin G	Penicillin V	Broxil	Celbenin
Staph. pyogenes (sensitive)	36	–6,–5,–5	–6,–5,–5	–6,–5,–4	0, 1, 2
Str. pyogenes ..	11	–7,–7,–5	–7,–6,–5	–5,–5,–4	–3,–3,–1
„ *faecalis* ..	13	0, 1, 1	0, 2, 2	0, 2, 2	4, 5, 6
„ *pneumoniae* ..	12	–6,–6,–5	–6,–5,–5	–5,–4,–4	–2,–2,–1
C. diphtheriae ..	7	–4,–4,–2	–5,–5,–3	–4,–3,–1	0, 2, 2
B. anthracis ..	14	–7,–6,–6	–7,–6,–6	–5,–4,–4	–4,–3,–3
N. gonorrhoeae ..	17	–8,–7,–3	–6,–5,–2	–5,–3,–2	–5,–4, 0
N. meningitidis ..	7	–6,–5,–4	–3,–1,–1	–1, 0, 0	–2, 0, 0
H. influenzae ..	8	–2,–1, 0	1, 2, 4	1, 2, 5	2, 2, 4
E. coli	11	5, 6, 6	7, 8, 8	9, 9,>9	>9
Salm. typhi ..	7	1, 1, 2	6, 7, 7,	8, 8, 9	8, 9, 9
Salm. paratyphi B	2	1	7	8	8
P. mirabilis (sensitive)	8	2, 2, 4	5, 7, 9	7, 9,>9	7, 8,>9
P. mirabilis (resistant)	8	>9	>9	>9	9,>9,>9
P. vulgaris ..	7	6, 9,>9	>9	>9	8, 9,>9
P. morgani ..	6	>9	>9	8, 9,>9	8, 9,>9
P. rettgeri ..	6	>9	9, 9,>9	8, 8,>9	6, 8,>9

* 0 denotes 1 μg./ml. Other figures are the $\log_2$ of the difference from this—that is, 1, 2, 3, 4 denote 2, 4, 8, 16 μg./ml. etc. –1, –2, –3, –4 denote 0·5, 0·25, 0·125, 0·062 μg. ml. etc. The first figure given is the *lowest* inhibitory concentration for any strain. The second (heavy type) is the *usual* inhibitory concentration. The third figure is the *highest* inhibitory concentration for any strain.

pronounced among these organisms. No other penicillin can compare with G in its action on *Haemophilus influenzae, Escherichia coli*, or *Salm. typhi*. The single exception to this, although of little therapeutic significance, depends on the fact that celbenin is alone in resisting the penicillinase formed by *P. morgani* and *P. rettgeri*, although not that formed by other *Proteus* spp. (Garrod, 1960b).

Discussion

Antibacterial activity demonstrable *in vitro* is only one property determining the therapeutic value of an antibiotic, and one should beware of exaggerating its significance. It is no true guide, for instance, to the treatment of enteric fever: several antibiotics are as active as chloramphenicol against typhoid bacilli in the test-tube, but not in the body. Nevertheless, in comparing antibiotics so otherwise similar as different penicillins, such comparisons as these must have some validity. Five years ago there was a discussion at the Antibiotics Symposium in Washington (Report, 1955–6) about reasons for the failure of a large dose of penicillin V to cure a substantial proportion of cases of gonorrhoea: no one suggested that the penicillin itself might be at fault, and the fact that penicillin V has indeed a lesser activity than penicillin G against the gonococcus has emerged only in the study reported here.

The resistance of celbenin to penicillinase places it in a class apart for the treatment of resistant staphylococcal infections, and clinical experience has confirmed its value for this purpose (Douthwaite and Trafford, 1960; Stewart *et al.*, 1960). When this infection is of a less serious nature, and treatment with celbenin is impracticable, the slower inactivation of broxil (and to some extent of penicillin V) by staphylococcal penicillinase, recommends its use in preference to penicillin G.

The place of the newer penicillins in the treatment of any other infections than staphylococcal is more doubtful. Penicillin G exceeds all other penicillins in activity against all other bacteria (except two uncommon species of *Proteus*), the differences being often wide. The nearest approach to the activity of penicillin G against important pathogenic organisms such as haemolytic streptococci and pneumococci is that of penicillin V, which may therefore reasonably claim to retain its place in the oral treatment of sufficiently sensitive infections.

Summary

The minimum concentrations of four penicillins inhibiting the growth of a variety of pathogenic bacteria have been determined, and the differences in activity so revealed are briefly discussed.

I am indebted to Beecham Research Laboratories for kindly furnishing supplies of broxil and celbenin; to Eli Lilly and Co. for supplies of pure potassium penicillin V; to Dr. C. S. Nicol for the specimens from which the strains of gonococci were cultivated; to Dr. Patricia Carpenter for some strains of *P. morgani*; and to Miss Pamela M. Waterworth for her skilled execution of the tests described.

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FURTHER NEUROPSYCHIATRIC OBSERVATIONS IN NIGERIA

WITH COMMENTS ON THE NEED FOR EPIDEMIOLOGICAL STUDY IN AFRICA

BY

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The present study is a supplement to the preliminary survey of neuropsychiatric problems in the Western Region of Nigeria (Lambo, 1955, 1956). Intensive studies (*British Medical Journal*, 1956) have been made in various parts of Nigeria, and the present article is an attempt to present a review of our work.

The need for epidemiological study in Africa, using small but effective samples, is urgent. The field for research in this direction, which has not yet been exploited, remains difficult, yet it is of first and ever-increasing importance (W.H.O., 1959; Lambo, 1959a).

Clinical Findings

I shall attempt to appraise briefly the most important types of neuropsychiatric disorders seen over a five-year period at Aro Hospital, the University Psychiatric Clinic, and the villages around Aro, a rural suburb of Abeokuta town, 60 miles from the Federal capital. In addition, patients have been referred to us from various parts of West Africa. We have therefore been well placed to see neurological, psychotic, psychosomatic, and neurotic patients of various types and in various subcultural and social settings. A supplementary rural survey (native treatment centres), the first of its type to be carried out in Nigeria, has also proved valuable, while many acute and episodic types have been admitted for study in the hospital (Tables I and II).

In respect of the usual terms "recovered," "improved," and "not improved," in the light of our experience among the rural and semi-primitive population of Africa, it is almost impossible to find any definable criterion on which to base the distinction. Consequently, we have deliberately dropped the term "recovered," as a result of which our "improved" group includes those who have recovered.

TABLE I.—*Aro Hospital, Other Mental Health Centres, and Native Treatment Centres (N.T.C.). Admission Data, 1954–8 (Western Nigeria)*

Diagnostic Classification	Treated at Aro		Treated at N.T.C.	
	Total	No. Improved	Total	No. Improved
Schizophrenia	960	486	635	452
Schizophreniform reactions	138	93	230	220
Anxiety states	250	210	330	317
Drug addiction	18	1	—	—
Chronic alcoholism	16	3	—	—
Endogenous depression	184	53	280	90
Organic brain syndrome	62	20	28	3
Manic-depressive	117	70	109	—
Psychopathic personalities	39	3	—	—
Involutional disorders	66	42	29	3
Obsessive-compulsive neuroses	10	2	23	21
Hysteria (conversion)	82	29	67	35
Psychoneuroses of ill-defined patterns	1,236	843	1,807	1,434
Puerperal and post-puerperal psychoses	315	34	211	6
Epilepsies with or without psychosis	219	102	36	2
Mental deficiency	83	53	64	54
Excito-motor syndrome and other unclassified psychoses (e.g., periodic psychosis)	180	146	122	120
Total	3,975	2,190	3,971	2,757

TABLE II.—*Classification of Cultural Backgrounds*

Diagnostic Categories	Treated at Aro			Treated at N.T.C.		
	Urban and Literate	Urban and Illiterate	Rural	Urban and Literate	Urban and Illiterate	Rural
Schizophrenia	370	320	270	363	180	92
Schizophreniform reactions	49	59	30	72	124	34
Anxiety states	71	93	86	94	170	66
Drug addiction (pethidine and hemp)	15	3	—	—	—	—
Chronic alcoholism	16	—	—	—	—	—
Endogenous depression	100	63	21	127	82	71
Organic brain syndrome	32	27	3	15	10	3
Manic-depressive	63	41	13	47	28	34
Psychopathic personalities	15	23	1	—	—	—
Involutional disorders	29	35	2	13	11	5
Obsessive-compulsive neuroses	5	3	2	14	9	—
Hysteria (conversion)	19	57	6	13	46	8
Psychoneurosis of ill-defined pattern	643	379	214	206	1,489	112
Puerperal and post-puerperal psychoses	173	110	32	127	63	21
Epilepsies with or without psychosis	41	72	106	4	18	14
Mental deficiency	11	18	54	2	14	48
Excito-motor syndrome and other unclassified psychoses (e.g., periodic psychosis)	—	72	108	2	10	110
Total	1,652	1,375	948	1,099	2,254	618

The mean age of the group of 960 schizophrenic patients at the time of onset of the illness was 23.45 years. There was no appreciable difference between the sex distribution of the major psychoses and well-known psychoneuroses. Excito-motor syndrome and malignant anxiety are, however, exclusively confined to men in rural and primitive areas. On this and other observations it seems that patients from rural, non-literate communities of Africa recover much more readily and quickly from the major mental disorders than the urbanized Africans.

In our clinical practice in Africa the term "improved" is entirely operational and is therefore reserved for those who on discharge have regained *some* capacity for the major social roles in the community. This means much more than the subsiding of the patient's symptoms in the environment which the "hospital" (N.P.T., village system at Aro, etc.) provides.

It should be pointed out that most of our patients admitted into the village community are accepted for treatment on account of a favourable prognosis; this is not the case in most, if not all, of the native treatment centres. This single corrective would, however, not serve to counterbalance any general inclination to optimism on our part regarding the superior and rewarding method of our approach. Since late 1958 the introduction of psychotropic drugs has added considerably to our "improved" rate, and this tendency has steadily continued, especially in those who have been treated in the village community. In Aro Hospital patients are admitted not only for the likelihood or not of recovery but also on account of their scientific interest for research and teaching.

Lack of space restricts full presentation of quantitative data and their analysis. However, there remains a great need for statistical assessment of these and other data, systematically collected, before a more refined design of inquiries could be made.

Psychoses

Schizophrenia seems to be by far the most common and crippling of all mental diseases in Africa. Shelley and Watson (1936) diagnosed schizophrenia in 30 (35.7%) out of 84 patients at the mental hospital at Zomba. Of the 906 patients treated at Aro in 1957–8, 48.4% were diagnosed as cases of schizophrenia. Carothers (1947) diagnosed it in 30.4% of 609 admissions in Kenya; Tooth (1950) in 19.1% of 173 mentally sick persons he examined in the Gold Coast; Smartt (1956; quoted by Tewfik, 1958) in 34% of 321 admissions to Dodoma; De Wet (1957) in 48% of African new admissions in South Africa; and Forster (1958) in 53.6% of 817 admissions in Ghana in 1956. In 1956 we diagnosed schizophrenia in 60% of 840 new "admissions" into 11 native treatment centres in Abeokuta Province.

In related cultures the findings point to high incidence. Mayer-Gross *et al.* (1958), in a study of 500 patients in Mysore Government Mental Hospital in India, estimated that "schizophrenia accounts for slightly more than three-quarters of the male patients and two-thirds of the females." In most if not all of these cases quoted the diagnosis was made on "conventional" lines

An important finding in our series was the lack of predominance of any subvariety, in contrast to the popular belief that catatonic schizophrenia is very common among the negro population of Africa. Also the assumption that "paranoia, paraphrenia, and even paranoid schizophrenia are relatively rare in Africans" (Gordon, 1936; Carothers, 1951) is wholly unsupported by our clinical findings.

The most vulnerable class of the population are the African students, whose mental health problems at home and abroad were discussed in a special article (Lambo, 1958).

Mayer-Gross *et al.* (1958), writing on the chronic mental patient in India and in England, stated: "The vastly different social and cultural backgrounds from which the two groups are drawn suggests that these factors are not of major importance in causation or in preventing chronicity." Our experience in Africa does not confirm this latter observation. We have found that lack of complete regression and of severe chronicity is remarkably noticeable in African schizophrenics, most of whom are ambulatory and are being treated within the community. It may be that institutionalization tends to produce severe chronicity in patients of all races and in all cultures.

Carothers (1953), who has observed that schizophrenia is *par excellence* the *chronic* form of mental disorder in Africans as in Europeans, has emphasized that this fact is reflected in all figures of *institutionalized* patients of African mental hospitals.

With the reservation in mind that it is almost impossible to draw valid comparisons between populations which are not only culturally different but also have completely different psychiatric services, we elicited the fact that comparative lack of severe chronicity or regression of African schizophrenics, as seen in some European hebephrenics, may be partly conditioned by genetic and constitutional factors and partly by the environment, but it is our view that the latter plays an important part in determining the threshold of incapacity or regression.

Our systematic observation over the five-year period has shown that the course of the illness can be modified (and chronicity is certainly preventable) by primary cultural factors inherent in certain environments.

In spite of the fact that our conception of schizophrenia is no broader than that commonly accepted in most countries, we share Tewfik's (1958) experience that "the prognosis of mental illness in Africa is good compared with England." "In Sierra Leone, where there is no psychiatrist, where the patients are only fed, segregated, and left to themselves without any organized activity of any kind, the percentage discharged to those admitted in the years 1948 to 1956 was 56%" (Maclay, 1956).

The general assumption seems to be that the outlook in the constitutionally provoked or genetically determined psychoses is one of recurrence, chronicity, or deterioration. Permanent recovery, however, seems to occur much more readily in African patients, probably more often than has been generally supposed by experienced workers in Western culture. Narrowing down our observation, we feel that, other things being equal, the favourable social and environment factors inherent in the community to which the mentally ill are exposed in Africa influence the threshold of incapacity.

It is our hypothesis that the difference in the course and outcome of the disorders can only be found in the differential cultural conditioning to which these people have been subjected, assuming that genetic endowment, especially in respect of predisposition to schizophrenia, is similar in all ethnic groups. It is an unproved but serviceable assumption.

One of the most important observations made within this five-year period is the comparatively quick recovery, lack of chronicity, and better therapeutic response generally of schizophrenic patients who are treated within the framework of the community. "Even when an unfavourable prognosis is recognized, positive

transfer of affect, under the conditions of the village, may be used to prevent patients from deteriorating" (Lambo, 1959c).

African Periodic Psychosis

Before concluding the chapter on schizophrenia it would be relevant to refer briefly to the interesting subject of periodic psychosis, so well known in Africa. We have fully studied 60 schizophrenic patients, comparing those who have shown primary symptoms and other well-known features of schizophrenia with comparatively progressive course with those well-known short-lived periodic psychoses* characterized by nocturnal agitation and excitement, encountered in the African (Shelley and Watson, 1936; Carothers, 1947; Tooth, 1950; Lambo, 1957a, b). In our experience many such cases are obscure and unclassifiable. The psychotic attacks are often transient, and the symptoms vague and ill defined in many cases. Criminal conduct may take place during one of these transient psychotic attacks, and when the patient is up for examination all symptoms of the psychosis may have disappeared. It is of first importance that the mental disorder should be recognized, so that justice may not miscarry.

Out of 30 patients in the latter category, 14 had committed capital offences before being seen, and in all of them symptoms simulating schizophrenic excitement or acute mania were observed or described during the phase when the offences were committed. The possibility of organic syndromes, amnesic fugues with or without mental confusion, and epilepsy was found to be strong; all the 30 patients had a history of at least one previous episode. The main differences observed are as follows: "periodic or transient psychosis" in the African is much more subject to spontaneous recovery than schizophrenia; affective reaction is evident even when there is evidence of schizophrenic process—that is, schizo-affective disorder; and evidence of chronicity is rare, even though it is also not commonly encountered in our ambulatory schizophrenics. Periodic psychosis seems to be predominantly, if not wholly, confined to the primitive African and is more frequent in rural and primitive surroundings than in urban areas.

The subject of this confusional psychotic state, which has been reported by many observers in Africa, is *sub judice*, as intensive study (psychological, clinical, and E.E.G.) is now being conducted in one or two centres in Africa. We suspect that this syndrome is an organic one, possibly an epileptic (and migrainous) variant. It is also not unlikely that some of the mental defectives with transient psychotic attacks recently identified by us may well belong to this group. In view of its obvious clinical and medico-legal importance, further details are desirable before any definite statement can be made.

Mental Disorders in Children

Our experience in Africa has shown that African children are not exempted from the various forms of mental disorder. In this cultural setting it is difficult to estimate the proportion of cases of schizophrenia in children, since quite a large majority of mentally ill children are treated at home for "bewitchment," etc. A further difficulty arises in the fact that, more particularly in this culture, no sharp line can be drawn between childhood and puberty; each case must be taken on its merits, and an examination for the presence of secondary sexual characteristics undertaken in every instance. This is not often easy to assess, since premature sexual development in African children may exist without the associated bodily changes. Furthermore, as in adults, it is often extremely difficult to estimate the boundary between normal and morbid.

In one case picked up in a village the psychosis developed from an already existing abnormality of make-up—autism. Mental symptoms occurring in the course of, or as sequels to, the infectious and contagious diseases and other fevers of childhood are not uncommon, though infrequent.

The clinical picture of the personality disorders which follow sporadic encephalitis in children is more or less protean in character, but certain psychotic and mental symptoms are characteristic and are discussed under "organic syndromes." There are impulsive, purposeless motor acts, aggression, destructive propensity, marked irritability, distractibility, attention disorder, variable and unstable emotional reaction, disorders of sleep, and, not infrequently, intense eroticism.

Psychotic reaction associated with pregnancy and childbirth is common among African women, more especially the latter category. Most of the psychotic reactions in this class run a malignant course with unfavourable outcome. Many such patients fail to recover from the first or second attack.

Affective Disorders

A recent follow-up study of 187 selected patients has shown that many mild depressives or manic-depressives had been seen and erroneously diagnosed as cases of psychoneurosis in the early stages, and it is our view that many more non-progressive endogenous depressives remain concealed by the label "neurasthenia" and never reach us. Also, most so-called "intractable psychoneurotics" are in fact endogenous depressives.

Depression is not invariably complained of—more particularly is this so when the condition has been one of slow development in a comparatively young individual. In 10 selected patients of the manic-depressive type recently observed it took an average of 26 weeks for four patients in this series to pass from this atypical depression into a manic phase.

Endogenous depression has a distinct clinical picture in Africans, characterized by periodic asthenia, multiple hypochondriacal symptoms of varying degrees of severity, mild but demonstrable sadness of mood, agitation and anxiety, lack of concentration, slight retardation, and general mental inertia. This mild clinical syndrome with predominantly psychosomatic overlay is usually the only feature of endogenous depression in Africans for years.

Phobic and obsessional symptoms and other neurotic features not only at the initial phase but throughout the course of illness are very common, whereas the depressive mood may not be very obvious. This seeming psychoneurotic syndrome in one or other form may be the most striking, if not the only, manifestation

* "The African is evidently prone to develop a type of twilight or confusional state—sometimes brief (a matter of hours), sometimes more prolonged (a matter of weeks)—but always tending to spontaneous recovery within a limited time" (Carothers, 1951). All our patients observed in this category recovered, usually within a short time, ranging from a few hours to a few weeks, and also showed schizophrenic-like symptoms with destructive tendencies outwardly directed.

of an attack of endogenous depression. Another characteristic feature of the disorder is its association with the almost constant loss of libido and of sexual power. This association is too frequent to be a mere coincidence. The cautious provisional recognition of the disorder in this way has proved of immense practical value in our clinical practice in Africa.

The patient is invariably preoccupied with vague somatic complaints and looks more anxious and agitated than depressed, even though the anxiety is a benign type of reaction. Insomnia of varying degrees is a most constant finding. A subjective feeling of difficulty in thinking may occasionally be complained of. Ideas of self-accusation or ruin, of fear for the future, of regret, and a profound sense of sorrow are often completely lacking or may feature in the terminal stages of the illness. Whenever the latter symptoms are prominent in the early stages organic depressive syndrome must be suspected. Functional sensory disturbances of a vague and ill-defined nature may be a prominent feature.

The course of endogenous depression, masquerading as psychoneurosis and treated as such, is a chronic one, but some of these cases often remit, and remit slowly, but frequently relapse. Response to superficial psychotherapy with sedatives, which often suffice in true psychoneurosis, are known to fail in this group of depressives. The response to electroplexy is dramatic. At the time of writing a trial use of mono-amino-oxidase inhibitors and/or regulators such as iproniazid (" marsilid "), nialamide (" niamid ") isocarboxazid (" marplan "), phenelzine (" nardil "), as well as imipramine (" tofranil ") and other psychic energizers is in progress. The preliminary results, together with those of electroplexy and other antidepressant drugs, are of considerable importance, for they seem to confirm in a most conclusive manner that we are dealing with a clinical entity, the essential nature of which is one of depression, even though depression itself is not a pre-eminent symptom.

The recognition of the frequency of this group of disorders enables us to differentiate such cases and exclude them from the heterogeneous mass of clinical material generally labelled " hysterical," a procedure which might help us towards a clearer view of the influence of cultural factors on endogenous depression. Laubscher (1937), without realizing the full clinical implications, has casually observed that among the Temba tribe, " all disturbances in the psychomotor sphere are attributed to stomach-ache, headache, and bodily pains, as do all psychotics." This indicates the cultural susceptibility of the ever-receptive mind to supernaturalism, and at the same time emphasizes that these familiar " bodily complaints " are never isolated phenomena, but are essentially a part of one " reaction." Thus we consider these unusual symptom-complexes to be of great diagnostic and prognostic value.

The importance of recognizing this aspect of the " reaction " as an index of the severity and depth of the illness, and for a proper understanding of the abnormal attitudes, does not seem to have been fully appreciated by previous authors.

In view of the marked psychosomatic overlay, behaviour of an African endogenous depressive gives at best a rough *quantitative* indication of the severity of the illness. Consideration of the clinical features, cited somewhat briefly above, has shown, I believe conclusively, that in most instances the outward affective state by no means corresponds to the patient's real feelings. Through some years of research we have found that our efforts to correlate symptoms with signs in the African have proved this to be a very difficult problem.

The diagnostic grouping of psychotic or psychoneurotic symptoms is no doubt useful ; yet this tends to give the student too much the idea that mental diseases are cut-and-dried entities. We find that it is very important, in our practice in this culture, to avoid diagnostic words that give a false sense of knowledge.

Ackerknecht (1943) recognizes the importance of these cultural factors in epidemiological survey and clinical practice in primitive cultures when he states, " In a culture where there are a number of 'native' forms of mental disease and a lack of its Western forms, two observers may come to opposite results, the one including, the other excluding, the former cases. The main source of misunderstanding is probably the fact that the primitive not only does not separate disease of the body and the mind in his medical concepts but also does not recognize such separate units. *His 'body' ailments may very often hide very strong 'mental' elements which may have escaped some observers.*" This is not to be compared in any way with those patients in Europe and America who show, over a varying length of time, multiple hypochondriacal and other somatic preoccupations as a latent manifestation of psychotic or severe psychoneurotic disorder, because, in Africa, witchcraft and supernatural forces play a major part in the psychodynamics.

This important observation of Ackerknecht is not confined to the primitives but cuts across the entire African society, irrespective of social status, class, or level of sophistication (Westernization). In fact, paradoxically, witchcraft and supernaturalism, producing massive " psychosomatic " problems, is more rampant among detribalized, urbanized Africans. Hallowell (1936) has well emphasized the importance of certain cultural factors inherent in primitive or simpler societies: " It is quite possible that the decline of supernaturalism in Western society has forever undermined the status of a genetic culture pattern which, in a multitude of forms, has been an effective, although to us naive authority, previously available to the individual as a means of resolving various forms of psychic stresses."

Our next consideration bears on the related problem of suicide. The question arises whether suicide exists to any considerable extent among primitives. With certain reservations, suicide as a symptom of psychiatric illness is rare, but in association with certain religions or cults is not uncommon. In recent years we have noted that suicidal attempts are very common among urbanized Africans, especially women who take poison.

Manic or hypomanic illness (or excitement generally) is apparently the most commonly encountered of all the affective disorders. Since it was the experience of most earlier authors that manic illness is much more frequent in negroes than in other races, it now becomes necessary to inquire into what really obtains.

Apart from the fact that mania, because of its social aspect, comes to notice much more readily than depression, we believe that cultural factors which give a subtle twist to the manifestation of depression also enhance or exaggerate excitement.

The preponderance of pathological excitement is real but has not been long recognized. In our observation on the forms and types of mental illness in Africans over a ten-year period, we have noted that most psychoses in our series showed a moderate to a marked degree of excitement with little or no prognostic or diagnostic significance. Acute excitement, apart from being a very common clinical entity, is frequently found in association with many neuropsychiatric conditions—namely, epilepsy, schizophrenia, post-encephalitic conditions, and in certain organic reaction types and hysteria, all of which are common in Africans. The *excitomotor syndrome* in one or another form may be the most striking, if not the only, manifestation of an attack of psychosis, which remits spontaneously, leaving the clinician in a dilemma.

Our present observations furnish strong evidence for the hypothesis that environmental causes (social ideals and customs—all of which have a hygienic or pathogenic effect) themselves tend to produce a group of cases within certain races or cultural groups, in excess of theoretical expectation.

The theory advanced above is further strengthened by the fact that many mental diseases in Africans have no typical or integrated constitutional aspect, but have, on the other hand, a demonstrably psychogenic basis. I commented: "In most of the endogenous psychoses occurring in Africans, especially primitives, psychical agents often seem to be pathogenetic while the constitutional factors fall into the background" (Lambo, 1956), since precipitating factors associated with emotional experience of considerable intensity are frequent—for example, grief. It has been found that the onset of affective disorders, especially endogenous depression, is always determined by an external cause —for example, the loss of a love-object, or the reverses of fortune. But, in spite of this, fundamental endogenous abnormalities of disposition can frequently be established.

Recurrent mania is often met with, and until the advent of psychotropic and ataractic drugs, especially phenothiazine, tranquillizers, and reserpine, recovery was very slow and uncertain, and recurrences were frequent. The cautious and judicious use of these drugs has revolutionized the management of psychiatric disorders in Africa. "Three years of Day Hospital work at Aro which necessitated the boarding of our patients in the surrounding villages showed that without these drugs, which reduced tension, excitement, and aggression in many of our patients, this scheme could not have been successful" (Lambo, 1957c).

Apart from the principal problem of therapeutics, there still remain certain questions, less essential, yet of considerable importance for the practice of psychological medicine, concerning which, I am afraid, we are still in the dark. These questions, which concern the need and use of psychotropic drugs in different cultures, still claim special studies for their definite position.

Psychoneuroses

Of all forms of mental-health impairment and psychiatric disorders, psychoneurosis is the most fascinating to study in this type of culture, which is partly primitive, partly transitional, and partly Westernized.

Our experience is based on the detailed examination and treatment of 1,578 cases of psychoneuroses (anxiety states, hysterical conversions, phobia, obsessive-compulsive neurosis, and mixed syndromes) drawn from these three classes of our population. Detailed information has been obtained about the onset, clinical course, and psychopathology of the illnesses. With regard to the question of their distribution in the community, conversion hysteria is rarely seen in rural Africans, while phobic states are often encountered only in sophisticated urbanized Africans.

Some observers believe that psychoneurosis is rare in primitive societies. Laubscher (1937) observed, "In view of the superficiality of repression, psychoneuroses, as understood by us, must be rare." Seligman (1911) expresses the view that hysteria or other psychoneuroses may be entirely absent in the tribe where ritual possession is practised.

It is *a priori* possible that certain races or cultures differ in the incidence of mental disorder by virtue of either an inherited constitution or a difference in the incidence of one or more exogenous factors, or by virtue of both these causes. Thus Ackerknecht (1943) says: "These reports on the scarcity of mental disease in certain primitive societies may partly be due to the fact that for social or biological reasons some cultures actually enjoy a greater mental health (with some it seems to be just the opposite). In others it may be due to a more effective psychotherapy (the wealth of psychotherapeutical methods in primitive medicine, although such methods are, of course, also efficient in 'pure' bodily disease, nevertheless suggests a certain amount of mental disease)."

We have found that not only do mental conflicts of various types and degrees exist in primitive cultures, but that their healthy solution is perhaps only too infrequent, this being due partly to supernaturalism and partly to the fact that in exotic cultures hard solidarity, which should merely act as a balance-wheel, in practice is a locked brake. We have found, too, that physical disturbances due to illness or incidental to the period of life have sometimes been found to be starting-points of neurosis, and, in few instances, of delusions.

We have been able to estimate that more than one-half of the persons who seek relief at the out-patient department of general hospitals in most African countries, and as many as 75% of people consulting native treatment centres in West Africa are suffering from psychoneurosis of varying degrees of severity and of one type or another. Among the more recognizable features of psychoneuroses in Africans are various forms of disturbances of the normal sleep rhythm. Inversion of the normal cycle of sleep and wakefulness, retardation of the sleep hour, and nocturnal excitement at fixed hours in the evening are not uncommon, but, by and large, restless sleep is the most common of all types of insomnia associated with psychoneurosis in Africans.

In this culture, where emotional components of physical diseases are also very common, practising physicians often hopelessly fail to identify symptoms depending not upon irreparable damage to fixed structures but upon the reaction of labile forces of personality to environmental stresses. Here is a challenge to diagnostic skill, and at the same time a therapeutic problem of great difficulty.

Anxiety States

There is probably no question which offers greater difficulties than that which concerns the treatment of

anxiety states in Africans. We know that in most cases symptoms may be removed and suffering relieved by rational psychotherapy, yet at the majority of general hospitals facilities for such treatment are sadly lacking. There is a steadily extending belief that these patients need something more than a bottle of medicine and a few words of reassurance.

This illness is the commonest emotional disturbance of the more chronic kind in the African student population (Lambo, 1958), as well as in detribalized and urbanized Africans. In primitive Africans it runs an acute course, in contrast to its tendency towards chronicity in literate Africans. Phobia is the basic factor in the psychoneurosis of the primitive.

Malignant anxiety states,* which are often met with in primitive Africans, have been described under most varied terms. I should like to describe briefly and in general terms the main types in relation to specific cultural factors.

Clinical examination, however, of 29 patients showed that the processes to be described are subject to such variations of development in different individuals, in some cases being so "imperfect" as to constitute a distinct psychological defect, that for our present purpose it is convenient, and indeed justifiable, to regard them as psychopathological entities. The most commonly encountered is *frenzied anxiety* (bouffée confusionnelle délirante). This condition has been regarded by some observers as a culturally provoked (autonormal) condition and genetically related to *possession*.

The alleged genetic relationship between these two conditions is based on a theory that both conditions (frenzied anxiety and possession) can be *self-induced*. The predominant symptom is acute fear with homicidal tendencies, not associated with possession† which is still widespread in Africa. In a series of seven capital cases studied for the purpose of giving medical evidence, the clinical conditions resembled very closely hysterical "twilight state," or actual fugue.

Symptomatically, fear and apprehension with somato-psychic delusions are characteristic. The same fear of bewitchment may also lead to thanatomania (Ackerknecht, 1943)—death from magic and auto-suggestion without any demonstrable pathological cause at necropsy.

With regard to the aetiology of those states, obviously more than one theory of pathogenesis can be entertained. The matter of constitutional predisposition and heredity has been gone into with care. In our series of 29 cases such diversity of constitutional backgrounds was found as to make any causal connexion between them and the abnormal behaviour unlikely. We now believe that frenzied anxiety is an affair of the individual, in relation to his environment, and not of the stock.

This condition, the onset of which is associated with some concealed source of anxiety ("perhaps only real to an African") and which can become "a very real type of insanity," is the commonest source of capital cases in Africa, though schizophrenia, in our experience, exhibits a collection of more bizarre crimes. Schizophrenics were found to constitute nearly two-fifths of the insane criminals in four large asylums in Nigeria.

In all these cases, what constitutes *criminal responsibility* is still a moot point. In practice, we have found that what is required in psychiatric testimony before the court in these cases is a proof that the patient (defendant) meets the requirements of one of the "tests" of irresponsibility ("tests" which are based on the Western criminal law). In Western jurisdiction it can be recognized that it is the *act* and not the individual which is the crux of the matter, in contrast to the "law of primitive society" in which the offender himself and not the crime itself receives the main attention of the law. Thus, paradoxically, "primitive law and justice" takes great care that a "crime is not divorced from the background or setting in which it occurs."

In some of these cases the patient "believes in his heart of hearts that any death will appease the gods, and that his own life can only be saved in this way" (Le Myth du Mpaka Fo of Madagascar (L. F. Marx, personal communication)).

Hysteria

The most striking feature of the 82 patients fully studied was the individual life-history, which disclosed many neurotic manifestations. A much greater proportion of our patients came from urban than from rural communities. In the Westernized African the disease has a low improvement rate and a very high chronicity rate, but is less severe among men than among women.

The major clinical manifestations of hysteria in *this* culture vary from various types of conversion symptoms, usually in women and young individuals, to behaviour aberrations that may simulate psychopathic personality and transient psychotic disorder. Hysterical fits are very common in urbanized schoolgirls between the ages of 12 and 17 years.

Periodic somatic disabilities—for example, paralysis, paraesthesia, anaesthesia, aphonia, deafness, etc.—are not uncommon among urbanized illiterate Africans. Massive hysterical disabilities of fluctuating intensity are typical of the primitive African suffering from hysteria in contrast to the monosymptomatic type of hysterical reaction of the Westernized African. The disease is uncommon in non-literate rural Africans, in whom acute but recent emotional difficulties can usually be easily unravelled and when, on occasion, there is only one major symptom—such a symptom in the primitive African seems bizarre and usually does not lend itself readily to formal interpretations.

There are, of course, in the primitive patients some symptoms which are susceptible to simple interpretations. For example, a non-literate woman aged 43 from a village suddenly felt that she could not retract her tongue after protrusion. She held her tongue out mainly during waking hours with copious salivation for nearly two weeks, during which she lost about 10 lb. (4.5 kg.) in weight. She maintained the protrusion to some extent during sleep. It was with great difficulty and under constant persuasion that she "managed" to take fluids. It was later discovered that a week before her admission she had quarrelled with her aged mother-in-law, who was known in the village to be an "aggressive witch." (For further information on the

*This is a term I coined to describe a group of clinical phenomena, the predominant feature of which is one of acute anxiety with or without aggressive behaviour. The most common of these is frenzied anxiety; however, it would seem inappropriate to classify this with anxiety states, and therefore its discussion under psychoneurosis is entirely provisional.

†Ackerknecht (1943) has, however, stated that "possession can be a mental disease among primitives, truly autopathological and most often compared with our hysteria."

clinical manifestations of hysteria among Africans, see Lambo, 1955, 1956.)

On the whole, the disease is more prevalent among women than among men. In Africa to-day women are gradually taking to untraditional habits, as the present-day social and economic conditions hamper them more and more in the exercise of their maternal and other traditional roles.

Menopausal symptoms and uterine fibroids are not uncommonly associated with pseudocyesis of long duration in African women from the rural area. In this culture pseudocyesis would seem to be culturally sanctioned with primitive sympathy of the group in married women who have failed to have children. (The chief end of marriage in most African cultures is procreation, and the "failure to accomplish this function seems to be the key to the understanding of some of the neurotic conflicts that would otherwise be puzzling to a European observer" (Lambo, 1956).) The treatment in these cases is one of *laissez-faire*, as personal experience has shown that the risk of precipitating a psychosis or severe anxiety state when the symptom is removed is not remote. Two such patients are still undergoing treatment, which was started in 1958 for a severe depressive illness that immediately followed what seemed to be successful treatment of pseudocyesis with severe anxiety state. Seven such cases were successfully treated during 1958. Four have since recurred, and two had a psychotic breakdown with depressive features two weeks later and are still under treatment. The last patient could not be traced.

One of the most important aspects of this subject that I should like to touch upon is the hysterical habit-continuation of physical illness. This is more commonly met with in Africans, and on many occasions has proved resistant to treatment.

As a result of culturally prescribed affective processes, suggestibility plays a very important part, and forms the basis of such neurotic reactions as the hysterical habit-continuation of physical illness. Also, in most African cultures the division between psyche and soma is arbitrary and ill defined. "There is no limit between the natural and the supernatural. The natural is supernatural and the supernatural is quite natural." Thus in this culture, more so than in others, every physical symptom seems to have its reverberation in the mind of the patient.

It is our experience that a "functional" addition to a previously existing organic lesion or habit-continuation of physical symptoms is common in those physical diseases that produce physical disabilities and severe emotional experiences—for example, severe malnutrition in childhood, encephalitis, post-operative conditions, and head injuries.

Organic Syndromes

One of the commonest causes of organic psychosis in the adult is trypanosomiasis. It is not unusual for this illness to manifest itself by mental symptoms alone, at least for a considerable time before the appearance of the more usually recognized features of the disease. In most cases sleeping precedes the onset of mental symptoms by many months or even years. Tooth (1950) observed the similarity between schizophrenia and organic psychosis due to trypanosomiasis. This observation has been confirmed in a number of cases of trypanosomiasis with predominantly mental symptoms.

Cerebral cysticercosis was found in less than 2% of a series of 60 consecutive cases of organic psychoses. Severe degrees of avitaminosis B with psychotic and neurological manifestations were also treated. Ancylostomiasis is a constant complication of all chronic mental disorders in Africa. This and other nematodal infections were responsible for 32% of cases of "hypochondriasis" referred to our clinic in 1959.

In a continent where encephalitis is endemic and physical diseases are common it is manifestly difficult to assess correctly many neuropsychiatric disorders from the pathological standpoint, especially in determining the primacy of either environmental or internal factors. One particular example here is the question of pathogenetic factors in the inception of brain damage in African children on the one hand, and the relationship of this to specific neuropsychiatric disorders in later years on the other (Lambo, 1957a).

During 1954–8 we saw and treated over 84 children in this category. In 33 (39%) of these we obtained definite evidence of brain injury of various kinds in the antenatal period and also during birth. The most constant findings were epilepsy, paresis, and some degrees of mental retardation. The latter finding is variable, and in some patients studied in 1950–2 the degree of behaviour changes was quite independent of intellectual impairment. In this series 38 (45%) had a definite history of "severe illness with or without convulsions," after which hemiplegia, epilepsy, and/or behaviour disorder, including marked retardation of mental development, were noticed. Histories of tuberculous meningitis and encephalitis were obtained from the clinical records of nine children with organic psychoses who were treated in various hospitals during the acute stage of the illness. In two others we were able to obtain a history of ill-defined illness characterized by pyrexia, and a rash in one, after which sudden changes in personality and behaviour were noticed.

It is generally believed that women living in primitive cultures, as do most indigenous Africans, go through pregnancy and delivery with comparative ease and with little inconvenience, but unfortunately there is still no record of the frequency of infantile morbidity—for example, brain damage—associated with these apparently easy deliveries.

Among some interesting organic syndromes we have seen and treated in African were psychoses associated with hypothyroidism, various native (medicine) toxic remedies, and filariasis. Three patients with severe psychotic manifestation with hypothyroidism were treated during 1958 and 1959. Two of these had the illness for two years without the usual and more easily recognizable manifestations of hypothyroidism.

The case which interested us most in this subject was that of a woman of 42 whose psychosis started insidiously and proved intractable to orthodox psychiatric treatment over a period of one and a half years. At the outset the illness closely simulated schizo-affective disorder with compulsive acts. In the course of time the symptoms became even more significant; she was taciturn, sluggish, and indifferent. Later she gradually started to put on excessive weight, mental sluggishness became more pronounced, and she

was losing the hair on the eyebrows. For diagnostic purposes, she was immediately put on thyroid (total 9–10 gr. (0.58–0.65 g.) daily) with astonishing results.

Discussion

I have attempted to present a cross-section of neuropsychiatric problems in Africa and to indicate the field of knowledge waiting to be materially widened, to the enduring advantage of physician and patient alike. In doing this, the usual and unusual features of some of the clinical entities have been enlarged upon and "explained" in terms of the social environment and the cultural setting in which the patient lives and reacts.

However, no other conclusion is permissible than that there is, throughout our comparative analysis, a fundamental similarity between the major mental disorders occurring in Africa and those occurring in other parts of the world. Most of the major psychoses and psychoneuroses have been seen. Others have been encountered which seem peculiar to Africa, and the clinical fact remains, and supports the view, that most of these do not fit into the existing nosological framework but are nevertheless susceptible to interpretation in terms of observable cultural factors. For example, most of the excito-motor syndromes are now known to be much more prevalent in the primitive areas and most common in certain religious (subcultural) groups within the community of Western Nigeria. We have, however, been unable to confirm the findings of earlier observers that endogenous depressions are rare among Africans. The latter, indeed, might be taken as a genuine rarity if we judge by the presence of the classical features of depression.

For a number of years we have given close attention to the interrelation of certain mental disorders and identifiable cultural factors (Lambo, 1955), and a series of cases have been kept under observation for a lengthy period. These patients have recently been re-examined, and the results are now given in a general form.

There is strong evidence in support of the notion of "a dynamic conception of both illness and its therapy," especially in a cultural setting actually or potentially loaded with variables that have never been satisfactorily understood or defined. Our present efforts are in aid of testing the criteria which have been based on Western culture. It is very easy to be so influenced by these theories that we find in them a place for each new observation, with never a pause for analysis and a fresh survey of facts. Even though the universality of these theories appears to us very doubtful in the light of our clinical work in Africa, the possibility of detecting in it general trends characteristic of human reactions as a whole appears very strong. The need for research work in Africa along these lines is urgent, and, in addition to giving rise to new problems, should help to throw light upon factors already known but imperfectly understood.

Our present approach is indispensable in the initial stages, since descriptive data are indispensable to clinical practice. It therefore becomes a matter of prime importance that clinicians, especially those working in the "back of beyond," should marshal their experiences, and set down their observations, with as much care and exactness as possible, and this while the question of the assessment of the relative importance of the factors in the aetiological structure awaits the results of further synthesis.

The dynamic state of most of the African societies and the perpetual social changes would seem in many places to lead to those deviations of behaviour which are usually merely considered from ethical or legal standpoints. New medico-social problems are rearing their heads in Africa, and the most important ones are those of alcoholism, prostitution and character disorder, sociopathies of various types, drug addiction (hemp, pethidine), delinquency, etc. A survey of these problems has been deliberately omitted from this article, as it is most inopportune to discuss them at present, since their nature and scope have yet to be scientifically assessed. Time, geography, culture, and social conditions are but a few of the factors which influence community health and the standard by which it can be measured.

The subject of health survey in Africa is manifestly complicated, especially in attempting to elicit some correlations, as this vast continent contains so many diverse cultures in varying degrees of aculturation. Cicely Williams (1958) says: "The indices of health are not only of rates of mortality and morbidity but also the incidence of violence, crime, alcoholism, delinquency, and inadequacy. If the medical services in developing countries were more aware of their social functions, they would become more respected as instruments of social policy." A demonstration of a correlation, if any, between such disease incidence and environmental factors would be of inestimable worth to medical administration in Africa. This line of research is being energetically explored by us.

In planning and organizing mental health services, psychiatry in underdeveloped countries could profit considerably from avoiding the mistakes already committed in very advanced countries of the world. When we, however, try to abstract a lesson from European and American experience we must make sure that it will apply in the contemporary African situation. "This is no easy matter, and we are getting more and more convinced that an independent diagnosis of our position may prove more profitable in the end than a borrowed remedy" (Lambo, 1959b).

Conclusion

Our present clinical observations in Africa have shown that, although in mental illness there may be some essentially basic factor in the onset of the illness (in endogenous psychoses, for example, the constitutional and genetic factors may be the *sine qua non* of their inception), yet the interplay between man and his physical and social environment would seem to influence considerably the evolution of the disorder—that is, its property of remaining latent or manifest, its later course, and its final outcome.

It must be emphasized that for a truly scientific understanding of human behaviour, especially that aspect of medicine relating to human ecology, man has to be studied at various stages of his social evolution—that is, at different times, in different cultures, and under various circumstances.

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CALCIUM DEFICIENCY IN RATS FED UPON MEAT

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Skeletal fractures resulting from a fall often cause the death of elderly people. Buhr and Cooke (1959) have collected much valuable information about the incidence of various types of fractures in the population of this country. In a pilot survey of fractures of upper parts of the femur, which commonly result from falls, they have found much higher incidences in elderly people than in young people, and in women than in men. During the past twenty years the incidence of these femoral fractures has increased. Opinions still differ, however, about the relative importance of the various factors which are concerned in their causation. According to one school of thought old people usually have poor sight and poor powers of balance. They therefore tend to fall more often and more heavily than younger subjects. Fractures may be incurred, therefore, without any preliminary weakening of the bones. Others believe that the bones break because they are abnormally fragile. This fragility may be due to hormonal imbalance—for example, in woman after the menopause. Dietary inadequacy of the nutrients responsible for the growth and maintenance of bone is another possible cause of fragility.

In practice it seems probable that the accident, and its fatal outcome, may be due to a combination of various causes. Undoubtedly many old people are unsteady in their gait. Examination of senile bones often reveals osteoporosis, which decreases their strength. Old age inevitably causes abnormalities in the supply and balance of hormones, which can weaken the bones and which also probably reduce the ability of the subject to recover from the injury. Finally, old people may lose their appetite for food, may be unable to obtain enough food, or may choose a diet which is inadequate in nutrients concerned with the health of the bones. This article reports experiments on rats, in the hope that the results may help us to assess the importance of this last factor in the human subject.

In the clinical study of skeletal diseases rickets has presented the most important problem. The control of this formerly common disease, by vitamin D and adequate and properly balanced supplies of calcium and phosphorus, has been a major triumph for medical research. As seen in infants and young children, rickets was usually associated with diets which included a high proportion of cheap farinaceous foods that were shown to be rachitogenic in proportion to their content of phytic acid (Bruce and Callow, 1934; Harrison and Mellanby, 1939). The possibility of diets rich in meat giving rise to skeletal abnormalities did not arise, at least in this country, since such diets are not regarded as suitable for young children. Moreover, among children of the poorer classes, with a high incidence of rickets, such diets would have been ruled out for reasons of expense.

For at least a century, however, it has been known that carnivorous animals develop skeletal deformities when they are kept in captivity and are fed on a diet of boneless meat. Thus Röll (1860) reported that young leopards developed rickets when they were given meat without bones, but not if bones were allowed. Later Bland Sutton (1889) observed that lion cubs in the London Zoo always had deformed bones when they were reared upon lean meat. The deformities could be prevented by the inclusion of crushed bones and cod-liver oil in the diet. Greaves, Scott, and Scott (1959) have described deformities of the bones in domestic cats fed on ox heart. The lesions were presumably caused by the low-calcium content of the heart-meat, since they could be prevented by the inclusion of calcium in the diet.

These observations of Greaves *et al.* seem important in approaching the problem of skeletal fragility from an angle which has long been neglected. We decided, therefore, to undertake investigations with a view to answering the following questions: (1) Can the skeletal lesions caused by meat-eating be produced outside the carnivora—for example, in the omnivorous rat? This question seems pertinent, because it is well known that the dietary conditions which give rise to rickets differ according to species. (2) Has heart muscle, used by Greaves *et al.*, any special significance? Can other forms of meat also cause skeletal lesions? (3) Are the lesions due to deficiency of calcium only? Or is meat injurious to the bones for other reasons as well?

Composition and Calorie Value of Meat

Before the start of our experiments we had to decide on the proportion of lean meat to fat which should be given to the rats in our experiments. The importance of this point may be readily appreciated from Table I.

TABLE I.—*Composition of Meat*

	Per 100 g.	"Edible Portion"	Lean Only
Ox heart	Protein (g.)	16	20
	Fat (g.)	11	3
	Water (g.)	71	76
	Calories	163	107
Steak	Protein (g.)	14	20
	Fat (g.)	29	1
	Water (g.)	56	78
	Calories	317	89

The calcium content of the "edible portion" of all meats is approximately 10 mg./100 g.

Thus the "edible portion" of ox heart, as supplied by the butcher with adhering pericardiac fat deposits, consists of 16% of protein, 11% of fat, and 71% of water. It provides 163 calories per 100 g. (Medical Research Council, 1945). The lean heart muscle, however, contains only about 3% of invisible fat, combined in the tissues, and provides only 107 calories per 100 g. In order to satisfy its calorie requirement, therefore, the rat must eat much more of the lean heart meat than of the "edible portion." For skeletal muscle (steak) the disparity is even greater, with 317 calories for the "edible portion" as against only 89 for the lean meat.

For all forms of meat the calcium content of the "edible portion" is given in food tables as 10 mg./100 g. Presumably this calcium is contained mainly in the muscle tissues, with a lower concentration in the adipose tissues. It seemed desirable, therefore, to carry out experiments both with and without the inclusion of fat in the diet. If skeletal lesions should result simply from deficiency of calcium more severe lesions would be expected with fat in the diet than with no fat, since the inclusion of fat would decrease the ratio of calcium to calories. If meat protein plays any special part in causing skeletal damage, however, the lean meat should be more injurious than meat with added fat.

Preliminary Experiments on Rats Fed Upon Ox Heart

Young piebald male rats were taken soon after weaning. Some were fed upon minced raw ox heart muscle, dissected free from fat. Others received a mixture of 75% of the lean muscle minced up with 25% of ox adipose tissues, either pericardial or from other parts of the body. Large amounts of the moist food were eaten by all the rats, but, as expected, those not given fat ate at least twice as much as those receiving fat. At first growth was more rapid in rats receiving fat than in those without fat, but later this difference was reversed. Presumably this was because growth was first limited by the intake of calories, but later by the intake of calcium.

Out of 10 rats given ox heart without fat, two died after anaesthesia for radiographical purposes, and out of the remaining eight there were seven survivors when the experiment was concluded after 81–83 days. Out of 10 rats given ox heart with added fat, two died after anaesthesia, and of the remaining eight only one survived to the end of the experiment. The others, after temporary growth, became emaciated and died.

Radiographs indicated skeletal abnormalities in all the rats. Thus, in those which had received only lean ox heart the *x*-ray shadows always lacked density, and in several instances the hind legs were fractured or deformed. The ribs, however, were normal in shape. Deformities in the dorsal portions of the ribs, with nodules and enlarged costochondral junctions, were seen in six of the rats which received fat.

Figs. 1 and 2 are radiographs of a rat fed upon ox heart and fat for 70 days. From Fig. 1 the thinning of the whole *x*-ray shadow, and fractures or related abnormalities in both femora and the left humerus, are evident. Fig. 2 shows the dissected hind legs and ribs. The injuries in the femora were obviously sustained during life. The bones were so fragile, however, that the fracture seen in the left humerus may possibly have occurred after death during handling or dissection of the carcass. In the ribs, decalcification and deformity are much more evident in the dorsal portions, shown uppermost, than in the ventral portions. This contrast was seen in all rats in which the ribs were deformed, and was presumably due to the difference in the structures of the two portions. It seems probable that calcium, once it has been laid down in the tissues, is reabsorbed into the blood-stream less readily from the ventral portions of the ribs, which consist of calcified cartilage, than from the more vascular bone of the dorsal portions.

FIG. 1

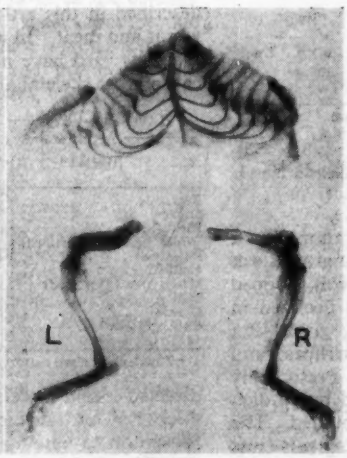

FIG. 2

FIG. 1.—Radiograph of a rat which had been fed for 70 days on a diet of ox heart (75%) and ox depot fat (25%). Compare with Fig. 4, which shows bones of normal appearance. FIG. 2.—Radiographs of the ribs (dorsal portions uppermost) and hind legs of the rat shown in Fig. 1.

Our results indicate, therefore, that the finding of Greaves *et al.* that a diet of ox heart causes fragility of the bones applies equally to the omnivorous rat as to the carnivorous cat. It also appears that ox depot fat is even more potent in causing skeletal injuries than the lean heart muscle alone.

In passing, we may mention evidence of intramuscular haemorrhage in the hind legs and in the lungs of the rat whose radiographs are shown in Figs. 1 and 2.

Throughout our experiments haemorrhage was occasionally seen in these sites. A detailed description of this lesion, however, seems beyond the scope of this article.

Rats Fed Upon Ox Skeletal Muscle (Steak)

Groups of five young female rats each were fed upon the following diets:

Group 1: Lean steak only.
Group 2: Lean steak (75%) + suet (25%).
Group 3: Lean steak + suet + $CaCO_3$ (0.5%).
Group 4: Lean steak + suet + vitamin D (200 I.U. weekly).
Group 5: Lean steak + suet + $CaCO_3$ + vitamin D.

All the rats were dosed with 500 I.U. of vitamin A weekly. Mean growth curves are shown in Fig. 3. It will be seen that growth in groups 3 and 5, both given

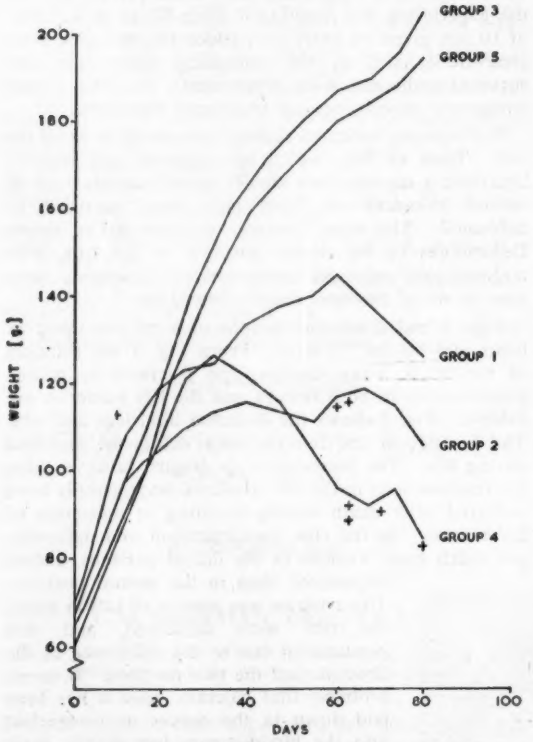

FIG. 3.—Growth curves of rats given diets of ox skeletal muscle (steak) with various additions.

steak, suet, and calcium carbonate, was more rapid than in the remaining groups. In groups 2 and 4, given steak and suet, but no calcium carbonate, growth stopped after the first 30 days. Many of the rats declined in weight, and eventually died. In group 1, given lean steak without suet, one rat developed diarrhoea, and died on the 10th day of the experiment. Presumably it had failed to adapt itself to its moist and bulky diet, and the importance of its death can be discounted. The mean growth rate of the remaining four rats was intermediate between those of the groups 3 and 5, given steak, suet, and calcium carbonate, and of groups 2 and 4, given the same diet but without calcium carbonate.

The condition of the bones ran parallel with the growth curves. In group 2, given steak and suet, the ribs of all the rats were misshapen, and there were many fractures in the dorsal portions. In group 4, given the same diet but with vitamin D, the bones were very fragile, and there were rib fractures in four of the animals. Fig. 4 is a radiograph from this group, and shows a fracture of the right tibia, with the formation of callus. The bones in groups 3 and 5 were normal. Fig. 5 shows the radiograph of a rat in group 3. It will be seen that the addition of calcium to the diet produced normal bones, even without dosing with vitamin D. In the rats of group 1, given lean steak without suet, the bones could easily be distinguished from those of the rats given calcium carbonate by their soft *x*-ray shadows. Deformed chests, however, occurred in none of the rats in group 1, and there were only two instances of fracturing in the dorsal portions of the ribs.

Estimations of the ash contents of the bones, kindly carried out by Dr. Olive Dunbar, of Queen's College, Dundee, gave results in good agreement with these findings. Thus the mean percentages of ash in the wet femora were as follows:

Group 1: Steak only	36.7
Group 2: Steak + suet	31.7
Group 3: Steak + suet + $CaCO_3$ ...	55.6
Group 4: Steak + suet + vitamin D ...	23.4
Group 5: Steak + suet + $CaCO_3$ + vitamin D	53.4

From these experiments we may conclude that: (1) the skeletal lesions induced by eating meat are not peculiar to a diet of heart muscle; (2) the substitution of some of the meat by fat increases rather than reduces the severity of the lesions; (3) the lesions are completely prevented by the inclusion of calcium in the diet; and (4) vitamin D, in the absence of calcium, is ineffective in preventing the lesions.

Discussion

Skeletal abnormalities in rats grossly deficient in calcium are no novelty. Thus Sherman and MacLeod (1925) produced lesions, presumably similar to those described in this article, in rats fed upon a mixture of wheat and meat. In many other investigations, however, the diets used have not been low enough in calcium to cause gross skeletal abnormalities. Interest was perhaps diverted from calcium deficiency *per se* after the discovery of further factors which influence the formation of bones, such as vitamin D, phytic acid, and the ratio between the intakes of calcium and phosphorus. Our results may therefore be instructive in showing that severe fragility of the bones, through gross deficiency of

TABLE II.—*Calcium Contents of Some Human Foods*

	Ca (mg./100 g.)	Ca (mg./3,000 Cals.)	Percentage of Requirement*
Fats, oils	0	0	0
Sugar	0	0	0
Meat (beef) ..	10	96	10
White bread (unfortified)	11	108	11
Potatoes	8	330	33
Codfish	25	1,090	109
White bread (fortified) ..	120	1,180	118
Milk	120	5,800	580
Cheese	810	5,800	580
Cabbage	65	7,500	750

* The daily calcium requirement of the normal man is taken as 1,000 mg.

calcium, can be produced by subsistence, exclusively on one common food which can otherwise be regarded as a harmless and nutritious item of our diet.

Reverting to our original interest, the problem of fractures in elderly people, we may suspect that a diet consisting exclusively of meat is indulged in by few old people, if any, in this country. We have seen in the rat, however, that lean meat may be even more injurious to the bones when mixed with fat. On the assumption that fat is injurious because it contains even less calcium than lean meat, it may be instructive to apply the same principle to human dietetics.

FIG. 4

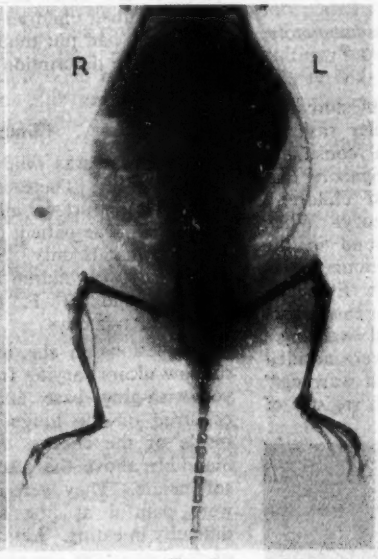

FIG. 5

FIG. 4.—Radiograph of a rat which had been fed for 81 days on a diet of ox skeletal muscle (75%) and suet (25%), with doses of vitamin D. FIG. 5.—Radiograph of a rat which had been fed for 81 days on a diet of ox skeletal muscle (75%) and suet (25%), with the addition of 0.5% of calcium carbonate.

The calcium contents of a few important foods are listed in Table II. The first column gives the calcium concentration in mg./100 g. of the food. The second column gives the amount of calcium which would be ingested if the food in question, and no other, were eaten, so as to provide the daily intake of 3,000 calories needed by an "average" man. The third column expresses this amount of calcium as a percentage of the accepted daily requirement of 1,000 mg. It will be seen that the range of calcium contents is very wide. The foods rich in calcium are milk, cheese, and green vegetables. Cheese contains no less than 80 times as much calcium as the same weight of meat. Of the foods listed, fats and oils, sugar, meat, potatoes, and unfortified bread would all be quite inadequate as sources of calcium if used as the sole article of diet. It is plain, therefore, that mixtures of these foods, which could provide a diet of reasonable palatability and variety, would also be grossly deficient in calcium. Whether an elderly person has an adequate intake of calcium would seem to depend on his liking for milk, cheese, and vegetables, and on the amount of milk which he consumes in tea and other beverages. If he does not like the various forms of milk or vegetables the provision of calcium in fortified white bread will go only part of the way to make good his deficiency.

According to Morris (1949) there is no doubt that some cases of osteoporosis, particularly in the elderly, may in part be due to defective intakes of vitamin D and calcium. The findings reported in this article give weight to this assertion, at least regarding calcium. Nordin (1960) considers that deficiency of calcium may be at least one of several factors in the aetiology of osteoporosis. In a small group of patients, aged 68–96 years, Vinther-Paulsen (1953) found that the incidence of osteoporosis was higher in patients with low intakes of calcium and phosphorus than in those with high intakes.

Summary

When rats were fed on diets consisting exclusively of meat they developed severe fragility of the bones.

The lesions were liable to be worse when the meat was mixed with fat than when lean alone was given. This was presumably because fat is even lower in calcium than lean meat. With fat in the diet growth eventually ceased, and many of the rats died.

Even with fat in the diet the skeletal lesions could be completely prevented, and growth maintained, by the addition of calcium carbonate to the diet. Dosing with vitamin D without calcium was ineffective in preventing the lesions.

The possible significance of calcium deficiency in the problem of fractures in elderly people is discussed.

Our thanks are due to Dr. L. J. Harris for his valuable criticism, to Miss E. Carman and Mr. P. E. N. Martin for technical assistance, and to Professor G. H. Bell, of Queen's College, Dundee, for his interest and advice.

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A colour film (16 mm., sound) on *Hospital Cross-Infection: Dressing Techniques in Wards 1960* has been sponsored by Smith and Nephew-Southalls. Ltd., and details of screening or purchase may be obtained from them at 5/7 Singer Street, London E.C.2. Technical advice was provided by the Sterilizing Research Unit, Little Bromwich General Hospital, Birmingham.

"HAND-FOOT-AND-MOUTH DISEASE" IN BIRMINGHAM IN 1959

BY

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In June, 1959, a child aged 3 had a painful stomatitis with fever, cervical adenitis, and a vesicular rash on hands and feet. He was referred to a consultant paediatrician (Dr. H. McC. Giles), who, recognizing that the disease was outside the usual run of children's infections, referred him to the virus laboratory. When three children similarly affected were found in the practice, the College of General Practitioners was notified and asked to help, through its Epidemic Observation Unit, to obtain reports of similar cases from other practices. In response to the "red warning" issued by the College, a total of 83 cases were notified in June, July, and early August. The "red warning" is a notification to members of the research register of the College that a condition fulfilling certain criteria has been identified as being epidemic in a given place. All those receiving the "red warning" are invited to return information of any such cases they may see to the Epidemic Observation Unit of the College. Of these 83 cases, 24 occurred in Birmingham, most of them being seen by J. A. and/or T. H. F. We were able in the other cases, by discussing them with the practitioners reporting them, to be reasonably sure that the patients described had a disease similar to that which we had ourselves seen. A few other cases were reported to us by lay witnesses; their children had had such a mild illness that the parents had not thought it worth while to call their doctor. The description below is based upon the cases seen by us.

FIG. 1.—Vesicular lesion on heel.

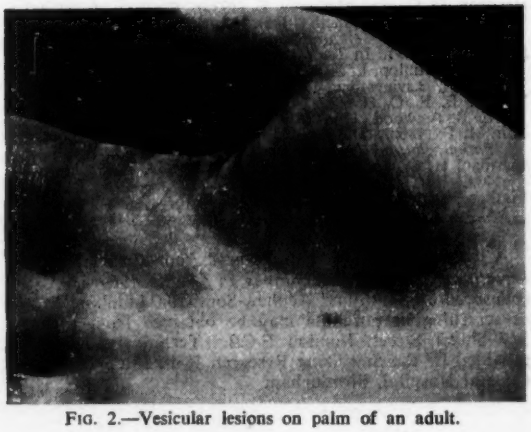

FIG. 2.—Vesicular lesions on palm of an adult.

Clinical Features

The disease was mild and in most cases lasted less than a week. There were no prodromata, and the presenting feature in all but two cases was a painful stomatitis. One patient (the oldest, aged 25) had lesions upon her hands only. Skin lesions were present in 19 cases, and two children had cervical adenitis and fever up to 100 and 101° F. (37.8 and 38.3° C.) respectively for one or two days.

The lesions in the mouth were irregularly shaped shallow ulcers varying from 1 to 10 mm. across, with a yellowish-grey base and hyperaemic margin. They occurred on the tongue, usually on its sides, on the inside of the cheeks, on the anterior fauces, on the mandible above the posterior molar tooth, and on the soft palate. They were not usually very numerous, but were painful at first and in some children caused difficulty in eating. Lesions were not seen on the outside of the lips or on the pharynx or tonsils. Although by the time we saw them the mouth lesions had always ulcerated, we were told by several independent lay witnesses that the mouth lesions had begun as vesicles.

Eighteen patients had vesicular skin lesions. The blisters were thin-walled and superficial, containing a clear fluid. They varied from 1 to 5 mm. across, and were irregular in shape, usually being oval rather than round. The blisters were usually pearly grey, thin-walled, and superficial, containing a clear serous fluid, and were surrounded by a zone of erythema about 1 mm. wide. The eruption was not profuse, and only three or four vesicles might be present in any one patient. They were not painful or itchy, and the contents were absorbed in two to four days; the lesions appeared in the later stages of absorption as cherry-red

FIG. 3.—Maculo-papular rash on buttocks.

spots. The vesicular rash was confined to the hands and feet, occurring mainly on the dorsum of the fingers and toes near the nail margins, and also on the heels (Fig. 1). They were not often seen on the palms and soles, but when they did occur they were more profuse, smaller, and more uniform in size, resembling small grains of rice. The one adult, who had superficial vesicles on her palms only, complained that the lesions were painful (Fig. 2). One child had a vesicle on the lobe of one ear in addition to those in the mouth and on the hands and feet. Four children had a maculo-papular rash on the buttocks (Fig. 3). Rashes are common on the buttocks in young children, but we think that this rash may have been part of the disease, because in its appearance and disappearance it coincided with the other lesions. Some parents reported a fleeting faint pink generalized rash, but this had gone by the time we saw the patients.

Epidemiology

The age distribution is shown in Table I.

The illness seemed to be highly infectious in the age-group principally affected, with a fairly constant incubation period of five to six days. Although on several occasions the illness could be traced from brother to brother, or from neighbour to neighbour, it is interesting to note that an isolated case occurred in a residential nursery where there were 20 children under the age of 5 years, and where the matron—a trained nurse—had been asked to keep a look-out for the disease. The occurrence and transmission of the disease are shown in Fig. 4. We saw patients in houses of every social class and in every grade of residential area, from the best of Solihull to the worst of Smethwick.

TABLE I.—*Age Distribution and Salient Features of Cases Seen in the Birmingham Area in* 1959

Age	No. of Cases	Stomatitis	Exanthem	Other Features
0–4 years ..	14	14	10	Two children had cervical adenitis and fever
5–9 ,, ..	7	7	6	
Over 9 ,, .	3	2	3	
Total ..	24	23	19	

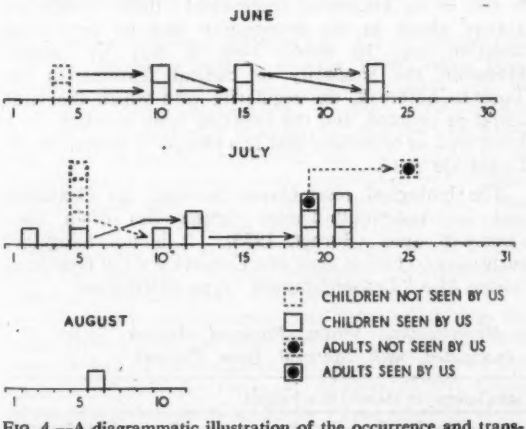

FIG. 4.—A diagrammatic illustration of the occurrence and transmission of the infection. The arrows indicate apparent transmission from case to case by contact; dotted lines represent transmission reported to us; continuous lines refer to cases we ourselves saw.

Virological Investigations

Culture Methods.—Faeces, swabs from the lesions in the mouth, fluid from vesicles, and acute phase and convalescent sera were taken for examination from five patients and single sera from two others, and also from as many of their mothers, fathers, and siblings as were willing to co-operate or who were of an age to yield blood without excessive difficulty. The supernatant fluids from about 20% w/v suspensions of faeces which had been centrifuged at 10,000 *g* for 20 minutes were inoculated into suckling mice by both intracerebral and subcutaneous routes, and were also inoculated into tissue cultures of human embryo-liver cells, embryo-rabbit-kidney cells (the HuLi and ERK1 lines of Westwood, Macpherson, and Titmuss (1957) and into human amnion and monkey-kidney-tissue cultures (the "untransformed" MK1 line of Westwood *et al.*). Some conventional baboon-kidney cultures of second and third passage was also inoculated. The cultures were not rolled. Subsequently attempts were made to infect roller tube cultures of human neonatal kidney incubated at both 33 and 35° C. using both Hanks solution and "199" solution as media.

Results.—No evidence of virus activity was found in any tissue culture, even after one or two subcultures. The faecal extracts from each of the children investigated who had the lesions and vesicle fluid aspirated from lesions on the hands of the adult caused flaccid paralysis in at least one suckling mouse, and in most cases all of the suckling mice, between the fifth and the eighth day after inoculation. This appeared in the first instance in one or two limbs only, though histological examination of some of these mice showed a generalized myositis, involving especially the intercostal muscles. All but two mice, which were allowed to recover, were killed at this stage. A clarified suspension of the ground-up carcasses was inoculated subcutaneously into further litters of suckling mice; by the fifth passage all mice were paralysed within three days. All attempts to isolate virus from faeces or to cultivate the prototype A 16 strain in tissue culture were unsuccessful.

Serological Investigations

Well-grown adult mice were bled out after being immunized by the method of Dalldorf and Sickles (1956).

To prepare an antigen for complement-fixation tests, 20% suspensions in normal saline of carcasses of suckling mice which had been paralysed at the fifth passage of an isolation from one of our patients were mixed with an equal quantity of the fluorocarbon "arcton 63" (I.C.I. Ltd.) and homogenized in aliquots of about 7 ml. in an M.S.E. masticator at maximum speed for five minutes; during this time the glass containers were cooled with chopped ice. A second treatment of the suspension produced a less hazy antigen, though its antigenic activity was neither enhanced nor diminished. However, a cross reaction to low titre (1:16) given by Coxsackie A 7 antigen with a hyperimmune serum prepared against one of our isolations, which was present after a single arcton extraction, was removed by the second treatment. The supernatants, after 10 minutes' centrifugation at 1,500 *g*, were in most cases further centrifuged in the Spinco Model L "40" rotor at 40,000 r.p.m. for three hours. The deposits were resuspended

in their own supernatants to one-quarter of the original volume. Some carcasses of mice partly paralysed by the inoculation of faecal suspensions were similarly treated to see whether there was at this stage enough virus in the carcass to provide a satisfactory complement-fixing antigen.

Neutralization tests were performed in suckling mice according to the method of Dalldorf and Sickles (1956).

Results

As Robinson, Doane, and Rhodes (1958) had described a similar outbreak in Toronto from which they isolated a virus serologically similar to Coxsackie A type 16, we put up a neutralization test against a virus (strain P) isolated from one of our patients and also against the prototype Coxsackie A type 16 virus, using the hyperimmune serum we had prepared. No significant difference was found between the two viruses; each was neutralized so that half the mice were paralysed with a dilution of 1:50 of serum. Both the first and second sera of this patient neutralized at a dilution of 1:5 the virus isolated from him (strain P) and also the prototype A 16 virus. A difference of at least fourfold in titre of neutralizing antibodies between the acute and convalescent phase sera of another child was demonstrated against both strain P and the Coxsackie A 16 prototype viruses; in each case the acute phase serum failed to protect completely when diluted 1:5; the convalescent serum gave complete protection at 1:20. Complement-fixation tests gave the results shown in Table II.

Some of the sera show a clear rise of antibody titre; others show a surprisingly high titre early in the course of the disease. This suggests either that the children with a high titre early in the course of the disease had had a previous infection by a serologically related virus, or that the incubation period was in fact much longer than it appeared to be.

TABLE II.—*Complement-fixation Titres of Sera from Patients and Contacts Against an Antigen Prepared from Prototype Coxsackie A 16 Virus. The Figures in Parentheses refer to the Interval in Days from the Onset of Disease at Which Sera were Taken*

Serum	Antigen			
Hyperimmune Mouse Serum against Strain P	Prototype A16 1 : 64		Strain P >1 : 128<1 : 256	
Patient	Acute	Convalescent	Acute	Convalescent
1 (from whom strain P was isolated)	>1 : 16<1 : 32 (2)	>1 : 8<1 : 16 (16)	1 : 64	>1 : 64<1 : 128
2	Negative	1 : 64 (15)	1 : 16	1 : 256
3	1 : 16 (3)	1 : 32 (17)	1 : 32	1 : 128
4	1 : 32 (10)	1 : 16 (21)	1 : 64	>1 : 32<1 : 64
5	1 : 32 (18)	1 : 32 (30)	1 : 64	>1 : 64<1 : 128
6	>1 : 16<1 : 32 (4)	Single serum	1 : 16	—
7*	Single serum	Negative		Negative
8*	,, ,,	,,		,,
9*	,, ,,	,,		,,

* These sera were collected from contacts.

In order to show that all the viruses isolated were serologically similar, antigens prepared from carcasses of mice paralysed by inoculation of the various faecal supernatants were put up in a complement-fixation test against the hyperimmune serum. The results (Table III) show that the viruses are all serologically similar, and that the first-passage carcasses contain as much antigen as those from later passages.

Discussion

It is clear that the disease is essentially the same as that described by Robinson *et al.* (1958), though in Birmingham it seemed to be somewhat milder than in Toronto. The clinical features are compared and contrasted in Table IV. They found that their virus was less easily neutralized by its own immune serum than was the prototype Coxsackie A 16 virus. This is not extraordinary; other viruses, notably influenza, sometimes behave in the same way. Our virus did not show this difference. Furthermore, their viruses were isolated in tissue culture; we were unable to do this. This difference is probably explicable on technical grounds; the recent paper on the isolation of the common-cold virus by Tyrrell and Parsons (1960) illustrates the effect that a small difference in medium may make in producing a cytopathic effect.

TABLE IV.—*Comparison of the Clinical Features Shown by Patients in the Birmingham and the Toronto Epidemic*

	Birmingham, 1959	Toronto, 1957
Total No.	24	60
No. of patients over 9 years old ..	3 (12%)	13 (22%)
Fever	2 (8%)	34 (56%)
Oropharyngeal lesions	23 (96%)	46 (76%)
Vesicular rash	18 (75%)	15 (25%)
Maculo-papular rash	4 (17%)	24 (40%)
Gasto-intestinal symptoms ..	0	20 (33%)
Respiratory symptoms	0	20 (33%)
Conjunctivitis	0	11 (18%)
Cervical adenitis	2 (8%)	0

Clinically, the lesions differ from those of herpes simplex and herpangina in occurring neither on the outside surface of the lips nor on the posterior pharyngeal wall. All attempts to isolate herpes simplex virus from these patients were unsuccessful.

It is always difficult to be sure that a particular disease is due to an associated enterovirus; these viruses are always about in the community and an occasional isolation may be made, even if only by chance. However, the similarity in clinical features to the Toronto outbreak, the regularity with which the virus could be isolated, and the isolation from a vesicle on a hand lead us to believe that this disease is indeed due to Coxsackie A 16.

The biological resemblance between the Coxsackie and foot-and-mouth-disease viruses has often been remarked upon (Burnet, 1959). It is not altogether surprising to find at least one Coxsackie virus producing lesions of a "foot-and-mouth" type distribution.

TABLE III.—*Complement-fixation Titres Given Against a Hyperimmune Serum, Prepared Against Serum P, by Antigens Prepared from Suckling Mice Inoculated with Material from Patients*

	Antigen from Mice Infected by Material from Patients									
Case No.:	1	2	3	4	5	6	7	8	9	A16 Prototype
Hyperimmune serum against strain P	1 : 64	1 : 256	1 : 64	1 : 128	>1 : 32<1 : 64	1 : 64	1 : 128	>1 : 32<1 : 64	>1 : 128<1 : 256	>1 : 32<1 : 64

Before we had identified the viruses we isolated, Dr. I. A. Galloway, of the Foot and Mouth Research Centre at Pirbright, kindly examined sera from two patients for us, but found no evidence of any antibodies against any of the standard types of foot-and-mouth disease virus.

Summary

An outbreak of mild infection characterized by vesicular lesions in the mouth and on the hands and feet occurred in Birmingham in the summer of 1959. A few patients also had a maculo-papular rash on the buttocks. Coxsackie group A type 16 virus was isolated from vesicle fluid from the hands of one. The disease was similar to that described by Robinson *et al.* (1958) as occurring in Toronto in 1957.

Our thanks are due to Dr. D. Hobson for the cultures of baboon-kidney cells, and to Dr. J. Hotchin for the prototype coxsackie A 16 virus. The technical work described will form part of a thesis for the F.I.M.L.T. by one of us (J. R. F.). Our thanks are also due to the College of General Practitioners, whose Epidemic Observation Unit enabled us to collect as many cases as we did.

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CANICOLA FEVER IN MAN FROM CONTACT WITH INFECTED PIGS

FURTHER OBSERVATIONS

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Outbreaks of human leptospirosis due to *Leptospira canicola* affecting workers on pig farms have been reported in Israel (van der Hoeden, 1956) and in Edinburgh (Seiler, Norval, and Coghlan, 1956). That apparently normal pigs were harbouring the organisms and were probably responsible for the outbreaks in the Edinburgh farms was finally established by Coghlan, Norval, and Seiler (1957) when they reported the isolation of *L. canicola* from specimens of urine collected from pigs at one of the farms where human cases had occurred. Surveys detailed in the same report revealed from the results of serological tests that 19 out of 47 piggery workers had been infected during the years 1950–5 and that over 40% of the pigs at three farms where 12 of the cases had occurred were or had been infected. In Glasgow, Michna (1959) found serological evidence of infection by *L. canicola* in the pigs at seven different farms and succeeded in isolating the leptospires from kidneys of naturally infected pigs.

Since the 1950–5 survey further sporadic cases of canicola fever have occurred among pig contacts in Edinburgh, and the present communication serves both to summarize the salient features of these cases and to show how a leptospiral infection in a herd of pigs may be maintained for many years, thereby constituting a hazard to any person coming in contact with the animals.

Laboratory Methods

The methods employed were essentially the same as those described previously (Coghlan *et al.*, 1957); live cultures of leptospires were used for the agglutination-lysis test.

Significant Agglutination Titres.—Titres of 1 in 100 may be indicative of past or newly acquired leptospiral infection of some kind, but in this investigation only titres of 1 in 1,000 and over are considered to be significant of present active infection in a herd of pigs. To confirm the diagnosis of human cases it was essential to show, during the course of the disease, a rise in the leptospire-agglutinating titre of the patient's serum.

Observations

With one exception all the cases dealt with here were ill enough to require hospital treatment. They were all of the meningeal type of leptospirosis; none was icteric. Since 1956 there have been 16 cases of canicola fever in the Edinburgh area, and 11 of these persons had been in contact with pigs. One was an abattoir worker engaged in slaughtering pigs, one was a child who played around a piggery, and the other nine were employed in tending pigs.

Five pig farms were involved—namely, C, D, E, F, and G, two of which (F and G) had been previously incriminated in human infections of *L. canicola*. Specimens of pig blood taken from a number of animals at each of the five piggeries at the time of the human outbreaks were found to contain antibodies to *L. canicola* in titres high enough to signify recent infection. The details of the 11 human cases are given in Table I and the results of the serological examination of the pig sera in Table II (these include some tests carried out more recently as well as at the time of the human infections).

Farm C.—In addition to the two cases of canicola fever at farm C, there was one apparently subclinical infection—Mr. U, who remained symptomless, although his serum agglutinated *L. canicola* to a titre of at least 1 in 30,000 at the time when his fellow worker, Mr. S, was in hospital suffering from a severe attack of canicola fever with classical symptoms. Serological tests revealed a 36% infection rate among the pigs.

Farm D.—The piggery owner became ill with pyrexia, polyarthritis, frontal headache, and vomiting. His serum at the time of admission into hospital failed to agglutinate *L. icterohaemorrhagiae*, and *L. canicola*. Nine days later the serum had a titre of 1 in 1,000 for *L. canicola* and 1 in 30 for *L. icterohaemorrhagiae*, and by the end of the third week the titres had reached their maximum of at least 1 in 30,000 and 1 in 300 for *L. canicola* and *L. icterohaemorrhagiae* respectively. At the same time the pigs were examined for serological evidence of infection, and it was found that 9 of the 11 sera examined had titres of 1 in 1,000 and over.

Farm E.—There were four cases of canicola fever—three in July-August, 1958, and one a year later. It should be noted that three of the patients were youths under 20 years of age who had only recently taken up

TABLE I.—*Details of 11 Cases of Canicola Fever and One Apparently Symptomless Infection Which Occurred Among Human Contacts of Pigs in Edinburgh During 1956–9*

Date of Onset	Patient	Age	Where Employed	Maximum Agglutination Titres	
				Against *L. canicola*	Against *L. icterohaemorrhagiae*
21/4/56	Mr. P	40	Abattoir	1/10,000	1/1,000
30/7/56	Mr. Q	15	Farm F 1	1/30,000	1/1,000
9/10/56	Mr. R	27	,, C	1/3,000	1/1,000
12/2/57	Mr. S	27	,, C	*	*
9/2/57	Mr. T	30	,, D	1/30,000	1/300
7/3/57	Mr. U†	29	,, C	1/30 000	1/10
25/7/57	Miss V	11	Played at Farm F3	1/3,000	1/10
17/7/58	Mr. A W	26	Farm E	1/100,000	1/10,000
18/7/58	Mr. B W	19	,, E	1/10,000	1/300
7/8/58	Mr. X	18	,, E	1/3,000	Neg. at 1/10
3/10/58	Mr. M Y‡	21	,, G		
14/9/59	Mr. Z	15	,, E	1/10,000	1/1,000

* Case diagnosed elsewhere; results not available.
† Symptomless infection (see text).
‡ This may have been a case of *L. icterohaemorrhagiae* (see Table III).

TABLE II.—*Agglutination Titres of Sera from Pigs Taken from the Five Farms Where 11 Human Cases of Canicola Occurred*

Farm	Total No. of Sera Tested	No. of Sera giving the Following Agglutination Titres Against *L. canicola*			
		<1/100	1/100 to 1/300	1/1,000 to 1/3,000	1/10,000 to 1/30,000 and over
C	25	14	2	3	6
D	11	0	2	6	3
E	12	0	0	2	10
F1, F2, F3*	73	40	9	21	3
G	44	1	8	25	10

* Three farms owned by Mr. A treated as one herd (F) (see text).

piggery work. All of the 12 pig sera examined agglutinated *L. canicola* strongly enough to indicate active infection among the animals; in fact, the titres of 10 of them were as high as 1 in 10,000 and over.

Farm F.—At farm F1 a 15-year-old boy who worked with pigs developed canicola fever in July, 1956. This farm is one of three owned by Mr. A and the conditions at all three of them are similar. Some sows are kept for breeding, but, in order to maintain an even number of pigs in the herds, purchases of young pigs at the age of three months are made at the local market at weekly or fortnightly intervals. Occasionally pigs are transferred from one farm to another, and for this reason the three are treated as one herd. The pigs are fed mostly on swill with the addition of a certain amount of meal. The premises are fairly old, and, although kept clean, the fact that the floors are uneven tends to result in the formation of pools of liquid consisting of urine, cleaning-water, and swill. The pigs are kept in small pens with approximately 10 in each. At farm F2 one of the workers had a history suggestive of canicola fever prior to 1955 (this was mentioned in the previous report) and more recently, in July, 1957, an 11-year-old girl developed canicola fever after playing around Farm F3.

Of the 73 pig sera from the three farms, 33% had titres indicative of infection by *L. canicola*.

Farm G

At this farm in Octbber, 1958, one of the farmer's sons, Mr. MY aged 21, contracted an illness with symptoms described by the clinician as "photophobia, headache, and muscle pains." Since he worked on a piggery the possibility that this might be a case of canicola fever was considered and specimens of the patient's serum taken at intervals were examined. The results are shown in Table III. Thus it appeared that the infection was of *L. icterohaemorrhagiae* and not *L. canicola*. Unfortunately, attempts to isolate the organism in order to confirm its identity, by culture and animal inoculation of the patient's urine, failed.

Serum from a rat caught on the farm failed to agglutinate *L. icterohaemorrhagiae* and *L. canicola*. Cultures of rat-kidney tissue inoculated into Stuart's medium failed to produce a growth of leptospires.

This case was of particular interest in view of the fact that one of the patient's brothers, Mr. DY, had suffered from canicola fever several years before and that serological tests carried out in 1955 during the survey of piggery workers had revealed that a third member of the family, Mr. RY, had also been infected by *L. canicola*. The results of the serological tests carried out in 1955 are shown in Table IV.

TABLE III

Duration of Illness	Agglutination Titres against	
	L. icterohaemorrhagiae	*L. canicola*
4 days	1 in 100	1 in 30
8 ,, ...	1 ,, 1,000	1 ,, 1,000
11 ,, ...	1 ,, 10,000	1 ,, 1,000
18 ,, ...	1 ,, 3,000	1 ,, 1,000

TABLE IV

Serum	Agglutination Titres Against	
	L. canicola	*L. icterohaemorrhagiae*
Mr. DY	1 in 3,000	1 in 30
Mr. RY	1 ,, 1,000	Negative at 1 in 10

There was therefore no doubt that identity of the infecting organism responsible for these two cases was *L. canicola*.

As shown in Table II 80% of the pig sera from farm G agglutinated *L. canicola* strongly enough to indicate recent infection. During October and November, 1958, when the third case (Mr. MY) was being investigated, 23 out of 26 pig sera had titres of 1 in 1,000 or more, while *L. icterohaemorrhagiae* agglutination did not exceed 1 in 300. The details of these serological tests are shown in Table V.

TABLE V.—*Examination of Pig Sera from Farm G During October and November*, 1958

No. of Sera Examined	Agglutination Titres					
	Against *L. canicola*				Against *L. icterohaemorrhagiae*	
	<1/300	1/300	1/1,000 to 1/3,000	1/10,000 to 1/30,000	<1/300	1/300
26	0	3	17	6	21	5

Leptospires were seen by dark-ground microscopy in 7 out of 10 specimens of urine taken at random from pigs at farm G during October, 1958; they were seen in the urine from the bladders of two pigs whose agglutination titres against *L. canicola* were 1 in 30,000, and were also seen in three specimens of bulked pig urine from pigs in three separate pens. The organisms were isolated from one of these latter specimens by inoculating two hamsters with the untreated urine and culturing small particles of kidney tissue from both hamsters killed one week after inoculation. Leptospires were also isolated by culturing particles of tissue from

the kidneys of two out of three pigs from this farm, chosen at random at the time of slaughter at the abattoir in October, 1958. These were indentified as *L. canicola*.

In February, 1960, over one year later, five pig bloods were examined to determine whether the infection was still present in the herd. Four of the sera agglutinated *L. canicola* to a titre of 1 in 3,000 and one to 1 in 1,000. *L. icterohaemorrhagiae* was agglutinated to a slight degree by all five sera, but in only one case did the titre reach 1 in 300.

At no time had any of the pigs shown any abnormal symptoms. Whether or not Mr. MY had indeed suffered from an infection by *L. icterohaemorrhagiae* of unknown origin or whether it was a case of canicola fever with an unusual serological response, the case revealed that the pigs on farm G are maintaining a *L. canicola* infection which has probably continued for many years.

Method of Husbandry at Farm G.—On this farm there are usually 500 to 600 pigs. No breeding is done and the pigs are purchased at the age of 3 to 4 months at the local market. They are mostly kept in three large courts and when they are small there may be 75 to 100 pigs in each. As they approach bacon weight, however, they are placed in smaller pens holding approximately 5 to 10 pigs. Under this system, with so many pigs running together, it is obvious that one infected animal may spread the infection throughout the herd, and this is demonstrated by the fact that 80% of the pig sera from this farm showed evidence of active infection. The premises are in good condition and are kept very clean, but the pigs are fed on swill, which is inclined to keep the floors moist, thereby predisposing to the survival of leptospires shed in the urine of infected animals.

Farms A and B, Where Cases of Human Canicola Fever Occurred in 1955

Finally, in order to determine whether the pigs were still infected in farms A and B, where the two original outbreaks of canicola fever occurred in 1955 (Coghlan *et al.*, 1957), a few specimens of blood from pigs chosen at random were examined in February and March, 1960. The results of the agglutination tests with *L. canicola* and *L. icterohaemorrhagiae* are shown in Table VI. These results make it quite clear that at both these farms the pigs are still actively infected by *L. canicola*.

TABLE VI

Farm	No. of Sera Tested	No. of Sera giving the Following Agglutination Titres						
		Against *L. canicola*				Against *L. icterohaemorrhagiae*		
		<1/100	1/300	1/1,000 to 1/3,000	1/10,000 to 1/30,000	<1/100	1/100	1/300
A	13	1	1	6	5	6	5	2
B	10	1	0	2	7	10	0	0

Although it is possible that reinfection of the herds may have occurred from some outside sources (dogs or pigs) during the time subsequent to the previous survey, it seems more likely that the infection has been maintained during the intervening period by passage from pig to pig. It may have existed on these farms for many years prior to 1955, when the diagnosis of several cases of canicola fever in piggery workers and our failure to find any infected dogs as the source of infection finally led us to suspect, and prove, that the pigs were acting as carriers of *L. canicola*.

These findings bear out those of our previous work, which indicated that the pig may be as effective a carrier of *L. canicola* as the dog. The infections previously found to exist in the piggeries five years ago have been shown not to be transient chance occurrences, but to have been maintained through the years, probably as a result of external conditions favourable to the survival of the leptospires. When several pigs all at the same stage of infection are excreting leptospires in their urine the organisms must be present on the floor of the pen in very large numbers, and the moist conditions which prevail in piggeries using swill will allow them to survive for a time outside the animal body, thereby constituting a hazard to any non-infected animals coming into contact with them.

It would be interesting to know if infections such as these are occurring in similarly run pig farms in other parts of the country. Evaluation of the results of serological tests should, of course, be made on a herd basis to obtain an accurate assessment of the infection rate.

Summary

Of the 16 cases of canicola fever in the Edinburgh area, 11 were found to be among pig-farm contacts. They occurred subsequent to our previous communication (Coghlan *et al.*, 1957) reporting a number of similar cases which had apparently resulted from contact with infected pigs.

Five farms were involved in the present outbreaks. A high percentage of the pigs at all of them were shown by serological tests to be probably actively infected.

Leptospira canicola was isolated from the urine and kidneys of pigs at one of the five farms where the infection appeared to have been maintained in the herd for many years.

At two farms incriminated five years ago in human outbreaks 87% of sera of pigs were found to have antibody levels high enough to signify that active infection is still present in the herd.

These observations indicate that the infection of a herd of pigs by *L. canicola* may be maintained for many years with the risk of human cases resulting from contact with the contaminated urine. This is especially apt to occur in young persons employed for the first time in work with pigs.

Similar investigations carried out on a herd basis to determine whether such infections are occurring in pig farms in other parts of the country are recommended.

Our thanks are due to Professor Robert Cruickshank for his interest in this work and for his helpful advice. We are also indebted to Dr. H. E. Seiler, M.O.H. Edinburgh, and to the clinicians who attended the cases for their interest and co-operation, also to Dr. J. P. Duguid for reading through the manuscript.

ADDENDUM.—Since this article was submitted for publication two more cases of canicola fever have occurred in recently employed piggery workers, one working on farm F (June 29, 1960) and the other on farm B (September 23, 1960).

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PLASTIC-BAG ASPHYXIA IN ADULTS

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The fatal results of the misuse of thin plastic material, particularly plastic bags, have received wide publicity recently in the medical and lay press both of this country and of the U.S.A. If placed over the face or head the soft plastic may become electrically charged, is readily inhaled into the mouth and nose, where it clings tightly, resists removal, and rapidly produces asphyxia (*B.M.J.*, 1959).

Such deaths were thought to be confined to infants and small children, but recently four adult cases of asphyxia due to plastic material about the head have been encountered in unusual circumstances and are reported here.

Case 1

On the night before his death this single 23-year-old schoolmaster stayed late at school, where he was building a canoe. In the morning his body was found wedged in a tall dustbin in one of the closets in the staff lavatory.

The body was head down, with the knees bent up to the chest and the ankles extended so that only the buttocks, soles of feet, and hands were visible. On the floor, beside the bin, was a woman's shoe, its fellow lying in the lavatory pan. On a looking-glass shelf above the wash-basins were a box of theatrical grease-paints, other theatrical make-up, and some grease-smeared cotton-wool. A large tin of motor grease was placed below the wash-basin, and elsewhere in the room a rubber kitbag containing pieces of net curtain, more cotton-wool, and scraps of rag was found. Beside the kitbag there was a home-made wooden box, hinged in the middle, 1 ft. (30 cm.) square and obviously intended as a mask, with holes for the neck, eyes, and mouth. The inside of the mouth-hole was smeared with grease.

Great difficulty was experienced in removing the body from the bin, which was 19½ in. (49.5 cm.) in diameter and bent slightly oval by the pressure of the body. A small amount of blood from the nose lay in the bottom of the bin.

The trunk was dressed in a plastic mackintosh, with a crêpe bandage crossing over the chest and the ends wrapped about the neck. Below the mackintosh there were three cotton skirts over a thin rubberized raincoat, and below this again a garment made from a large plastic bag by cutting holes for the arms and neck. About the abdomen and between the legs was a sheet of plastic curtain material with some ejaculated seminal fluid on its inner surface. A pair of false breasts, filled with towelling, were strapped over the chest, and the only male garment was a pair of underpants.

A woman's plastic raincap over a rubber bathing-cap covered the head. Net curtaining was tied over the face, which was covered by a "polythene" sheet in which were holes cut for the mouth and eyes. A thick layer of motor grease covered the cheeks and eyes, and, having apparently run, partly occluded the mouth and nose. The face was symmetrically criss-crossed with red and green grease-paint, and blue grease-paint had been smeared over a large area of each cheek.

Necropsy.—Death was due to asphyxia. The skin of the face and shoulders was congested and contained large petechiae, and many petechiae were also present in the oedematous conjunctivae. All organs were acutely congested: large petechiae were present in the interlobular tissues of the lungs, with a few smaller ones in the posterior lung surfaces and epicardium.

Personal History.—This man, who is believed to have been unduly attached to his mother, came from an artisan home with parents of strong religious beliefs, and he himself attended church regularly. No past history of sexual abnormality is known, and the only association with the opposite sex was recent and concerned the sharing of a common interest in dancing only.

Case 2

In the early afternoon a 43-year-old engineer drove to a public lavatory known to the police to be frequented by homosexuals. He failed to leave a closet, and was found dead there after forcible entry by the police.

The body was fully and properly clothed except for the jacket, which hung on the door. It was, however, encased from head to foot in a large, thin, transparent plastic bag such as is used to protect long garments, and which measured 6 ft. (1.8 m.) in length and 4 ft. (1.2 m.) in circumference. A handkerchief lay loose inside the bag. The bag was removed by the police before medical examination, and no other unusual feature was found.

Necropsy.—Death was due to asphyxia. The organs were acutely congested, and the only petechiae, which were small and few in number, were in the rectum. A bead of seminal fluid was present at the meatal orifice.

Personal History.—He was said to be normal, cheerful, and happily married, had a family, and did not have any financial or other difficulties. He had been known to express disapproval of suicide. For some years he had complained of "stomach troubles," for which no organic cause had been found, and in recent months had been in the habit of carrying plastic bags in his car "in case of sudden sickness."

Case 3

A 23-year-old recently married schoolmaster, after a day spent out with his wife, urged her to retire early as she felt unwell, stating that he would join her shortly. When he failed to do so she came downstairs and found that easy entry to the living-room had been prevented by the carpet being placed against the door. In the room her husband, dressed in shirt, tie, and trousers, lay dead in an armchair. A thin transparent plastic bag, which his wife had left on a table by the chair, covered the head and shoulders. The bag, removed before medical examination, was 2½ ft. (0.76 m.) long and 3 ft. (0.9 m.) in circumference, and two holes, 6 in. (15 cm.) apart and each 2½ in. (6.3 cm.) diameter, had been made close to the open end, where a handkerchief lay. There was evidence suggestive of masturbation.

Necropsy.—Death was due to asphyxia. Acute congestive changes affected all viscera, and the only petechiae were in the tips of the duodenal villi.

Personal History.—This man, who married a few months earlier, is said to have been rather a poor mixer, somewhat lacking in a sense of responsibility, and rather happy-go-lucky. He had no medical complaints, and there is no known history of any sexual abnormality.

Case 4

A 21-year-old telephone engineer, in excellent health, was described as having no worries and no interest in women.

On the day of his death he appeared in every way normal, and was left in the house alone for a few hours in the morning. He was found dead about noon, lying face down on a bedroom floor, and clothed only in a pair of women's

panties. Over his head was a plastic bag, 2 ft. (0.6 m.) long and 15 in. (38 cm.) wide, which was immediately removed by the relative who found him: a band of elastic was later removed from the neck by a neighbour who came to help. The body showed evidence of cyanosis, particularly about the face, and bleeding from the nostrils was noted. Death was considered to be due to asphyxia, and a necropsy was not carried out.

Discussion

The danger of rapid asphyxial death as a result of covering the face with plastic sheeting is very real. Such accidental asphyxia by plastic bibs in infants, and, more commonly, by plastic bags in young children, has been widely publicized, and some American manufacturers now print a warning of the danger on their plastic bags. This type of asphyxia in adults, however, is extremely rare.

In the adult cases described here a possible object in covering the face or head with plastic might be to commit suicide. This seems unlikely, however, as in none of these cases was there a suicide note or threat, none was emotionally disturbed or in any way different from usual beforehand, and the form and place of death were unusual.

If suicide was not intended death must have been accidental, and it is very likely that none realized either the difficulty which might be experienced in removing the plastic material or the rapidity with which asphyxia might occur. It seems almost certain that the plastic sheeting and bags were put on for some purpose, and there is strong evidence that in at least two instances (Cases 1 and 3) the purpose was a sexual one.

In Case 1 the man was clothed as a woman and was obviously a male transvestite who was enacting a sexual scene. It follows that the use of plastic material and rubber garments must have a meaning within the total sexual ritual. However, in addition to having plastic material over his face and body, he was wedged in a dustbin in the foetal position. It might be speculated that his desire to enclose himself was not fully satisfied by covering his face and body by plastic material, and that he had to actualize his fantasy further by entering a rigid framework: if this was the case a possible explanation is that of a desire to return to the womb.

Case 4 is another example of male transvestism, with the additional factor of a constricting elastic band about the neck.

In Case 3 the body was found with head and shoulders covered by a plastic bag and showing evidence strongly suggestive of masturbation. The perversion is less well developed in that he was not clothed in an abnormal manner, but it is possible that he also had some regressive desire to return to the womb. Possibly his activities, and probably his fantasies, were much less elaborate and worked out than in the first case, and he may have vaguely sought after a strange experience without having a clear understanding of what he was doing.

In Case 2 the body was found in a public lavatory known to the police to be a rendezvous for homosexuals. In this case there was no evidence of any sexual activity, but the body was completely encased in a huge plastic bag, and asphyxia would probably occur before any intention could be carried out.

So far as is known, none of these cases were homosexuals, and all appeared to be obtaining a sexual pleasure from a solitary activity. It is clear that two were transvestites, and from this it is reasonable to postulate that the psychological make-up of the other two was similar.

While not fully qualified to discuss why transvestites should use plastic bags, the nature of the evidence is such that it seems reasonable to assume that all of these cases had some desire to be enclosed or confined, as was the case in two instances, one also being in the foetal position. A desire to return to the womb is said to be a recognized unconscious fantasy, and it is likely that this motivation existed in two of the cases and may well have existed in the others but was less fully expressed.

A much less elegant and more superficial explanation is that these people were trying to achieve some undifferentiated thrill or excitement from partial suffocation or anoxia. This factor may have existed, but it does not explain the transvestism, sexual arousal, or complete enclosure of the body.

It is an interesting reflection that the sexual impulse in man is so protean in its manifestations that a technical advance resulting in a new packaging material can result in a new perverse manifestation.

Summary

Death from asphyxia in four adult males is described: in three instances a plastic bag was placed over the head and in the fourth plastic and rubber sheeting covered the face.

Two were transvestites, and the psychological make-up of the other two may have been similar.

The evidence suggests that all may have had some desire to be enclosed, and an unconscious desire to return to the womb may have been the motivating factor.

We thank Mr. E. J. Chapman, Mr. H. A. Howden, Mr. Malcom Moss, and Mr. C. L. Phillips Powell, H.M. Coroners for the Borough of Grimsby, Caistor District of Lindsey, Northern District of Leicestershire, and the City of Hereford respectively, for permission to publish the necropsy findings of the four cases.

REFERENCE

Brit. med. J., 1959, 1, 1463.

Medical Memoranda

Facial-nerve Grafting in the Parotid Region

Sometimes the facial nerve is so inextricably involved in a parotid neoplasm that adequate removal of the latter necessitates complete parotidectomy with sacrifice of the nerve. In the past, in such cases, I have then improved the facial appearance with fascia lata or temporal fascia and temporal and masseter muscle slings. Such a repair leads to an almost normal appearance of the face when in repose, but the presence of the paralysis is at once obvious on movement.

Figs. 1, 2, and 3 are photographs of a 55-year-old woman in whom, 11 months previously, I had carried out complete right parotidectomy for neoplastic disease. At the end of the excision there could easily be seen the divided two proximal temporo-facial and cervico-facial branches and five distal branches of the facial nerve, the gaps between the two sets being about 1¼ in. (4.4 cm.) long. Two Y-shaped portions of the right great auricular and transverse cervical nerves were then obtained through the lower part of the original incision. These portions were sutured, with fine silk on

FIG. 1 FIG. 2 FIG. 3

FIGS. 1, 2, and 3.—Photographs of woman in whom complete right parotidectomy had been performed, with excision of portions of all the divisions of the facial nerve, and repair of the nerve with nerve-grafts, 11 months previously. (1) Right lateral view. (2) Closing eyes. (3) Smiling.

minute atraumatic needles, to the two proximal and the four upper distal severed segments of facial nerve. The incision was sutured without drainage.

Post-operatively, she had galvanism and massage to the face a few times, but because she dislikes hospitals, and for domestic reasons, she soon stopped attending for further physiotherapy. It had been intended to fit her with a dental cheek-splint, but for this also she did not attend. It is likely that facial-nerve function will improve even more than when the accompanying photographs were taken, but we shall probably not be able to persuade her to attend for further examination.

COMMENT

There are several previous reports of successful facial-nerve grafting in the parotid region (Lathrop, 1953a, 1953b; Maxwell, 1951, 1954, and others quoted by him), mainly in specialist otological literature.

This note is submitted with a view to making more widely known this procedure, which was found, unexpectedly, so successful and relatively simple. It seems likely that the more distal a facial-nerve graft the more satisfactory the result, especially with regard to the recovery of function of the forehead muscles and the non-occurrence of facial mass movements.

The great auricular nerve is readily found in the upper part of the neck about ½ in. (1.3 cm.) behind the external jugular vein, in the superficial fascia, at the same depth under the skin as the vein. An advantage of using this nerve for distal facial-nerve grafting is that Y-shaped portions of it are readily dissected out. If more nerve is required, a segment of transverse cervical nerve can be obtained. It can be found at the posterior border of the sterno-mastoid muscle, at about its middle, curving forwards; it runs deep or superficial to the external jugular vein, and perforates the deep fascia at about the anterior border of the sterno-mastoid muscle; it also subdivides. It arises by a common stem with the great auricular, and this stem is readily available and furnishes a further Y-shaped piece for grafting.

If cervical nerves are not available the anterior cutaneous nerve of the thigh can be used; it is found through either a transverse or an oblique incision in the front of the thigh, about a handbreadth below the inguinal ligament, where the nerve pierces the fascia lata over the sartorius muscle, about ¼ in. (2 cm.) lateral to the saphenous vein, either as two branches or as one trunk that soon subdivides into two.

Dott (quoted by Kettel, 1958) uses the sural cutaneous nerve for joining the divided facial nerve from the cerebello-pontine angle to the parotid region. The medial sural cutaneous nerve is found piercing the deep fascia about the middle of the back of the leg, and, uniting with the peroneal anastomotic branch of the common peroneal nerve, forms the sural nerve, which runs downwards near the lateral margin of the tendo calcaneus; a long stretch of nerve can be obtained. If it is desired to include the anastomosis it does not matter to the results of nerve-grafting whether the graft is reversed or not.

Kettel (1957) likes the ilio-inguinal for grafting the facial nerve in the temporal bone; Maxwell, the great auricular for facial-nerve grafting.

A straight piece of nerve can be split to furnish the necessary branches (Maxwell, 1951).

The anaesthesia produced by division of most cutaneous nerves is of little consequence; often it disappears in a few months, probably through ingrowth of nerve fibres from adjacent nerves into the affected area (cf. Weddell, Guttmann, and Gutmann, 1941).

ADDENDUM.—Since the above was submitted for publication a 1-in. (2.5-cm.) gap in the cervico-facial division of the facial nerve has been successfully grafted with a y-shaped piece of great auricular nerve in another patient.

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Reviews

OBSTETRIC PATHOLOGY

Obstetrical and Gynaecological Pathology for Postgraduate Students. By R. E. Rewell, M.D., M.R.C.P. (Pp. 435+xii; illustrated. 50s.) Edinburgh and London: E. and S. Livingstone Ltd. 1960.

This little book will become a classic. Perhaps "little book" is a misnomer, for it contains 435 pages literally crammed with information of the greatest value. None the less, one of its many attractions is that it *is* a little book measuring 5½ in. x 8½ in. and of a weight and thickness that make it easy to handle. The large pocket of many an overcoat would conceal it. The author writes from a wide experience of his subject accumulated in his work as pathologist in the Liverpool Maternity Hospital and Women's Hospital, and as Professor of Pathology at Madras, where he worked under the Colombo Plan in 1956–7.

Dr. Rewell has presented his material in a style that is both lucid and concise. His aim was to help candidates preparing for higher qualifications in obstetrics and gynaecology, and he has succeeded so admirably that the book is certain to be in demand by a much wider public. This will include senior medical students as well as practitioners engaged in clinical practice in obstetrics and gynaecology. All who are anxious to keep up to date will find this a valuable book.

The text is well illustrated by 150 carefully chosen plates, most of which have been prepared from photomicrographs and are beautifully reproduced. Superimposed arrows pinpoint relevant details. The concise text makes occasional lapses like the following more difficult to understand, "Uterine and cervical cancers show a steady increase in incidence with advancing years among women surviving." The latest views on the metastatic spread of carcinoma of the corpus deserve more careful reference and there is some apparent confusion between the statement that metastases occur late, and that pelvic glands are involved in "only about half of necropsy cases." The nature of material referred to deserves better definition. The terminal index is too concise and as a result there are many omissions.

References to original papers are lavishly indexed to an extent that makes the book worth buying for reference purposes alone. It is an excellent production on which both the author and the publisher are to be congratulated.

J. STALLWORTHY.

DENTAL ANAESTHESIA

General Anaesthesia for Dental Surgery. By R. S. Walsh, M.A., B.M., B.Ch., F.F.A. R.C.S. Foreword by G. Edwards, F.F.A. R.C.S. (Pp. 94+ix; illustrated. 21s.) London: Longmans. 1960.

This book is concerned almost exclusively with the use of nitrous oxide in out-patient dentistry. There are brief sections on physiology, pharmacology, apparatus, and the use of supplemental drugs. While rightly condemning anoxia, the author admits that a certain amount is inevitable, but considers brief periods in fit subjects to be without risk. Without doubt, if the instructions laid down were followed carefully, little harm might be expected to result from the thousands of "dental gases" administered daily throughout the country. It would have been nice if acknowledgment had been made to the teaching of other textbooks on similar lines, for this monograph contains little that is new.

Dr. Walsh is unpenitent in regarding nitrous oxide as the anaesthetic of choice for out-patient dentistry, and his infectious enthusiasm is reflected in the description of the practical application of the method. It is noteworthy that at a time when nitrous oxide is so much under fire because of its attendant lack of oxygen little space is devoted to alternative techniques. "Amnalgesia" and the use of cyclopropane are mentioned, but without sufficient detail to allow the student or inexperienced practitioner, to whom this book is primarily directed, to be able to assess their value.

R. BRYCE-SMITH.

STRUCTURE OF CEREBRUM

The Postnatal Development of the Human Cerebral Cortex. By J. LeRoy Conel. Volume VI. *The Cortex of the Twenty-four-Month Infant.* (Pp. 310; illustrated. £5.) Cambridge, Massachusetts: Harvard University Press. London: Oxford University Press. 1959.

In this sixth volume of the series Dr. Conel has continued his study of the development of the human cerebral cortex by describing its appearance at the 24th month. All the architectonic subdivisions of the cortex have been systematically examined in sections stained to demonstrate not only cell bodies but also the myelinated and non-myelinated fibres. Each area is described in detail and the text is illustrated by almost 100 photographs. Quantitative data on the density of cells and fibres, the thickness of individual laminae, and the degree of myelinization are included in several tables; these alone are a sufficient indication of the thoroughness of the study. The salient structural features at this stage are discussed in relation to their possible functional signficance, while some of the problems of the metabolism of the neuron and of the blood–brain barrier are reviewed. This volume, like its forerunners, is a monumental example of patience and industry, and the collected works form a useful book of reference. The detailed description of the cortical cells should be of value to neuropathologists.

T. P. S. POWELL.

CURRENT HAEMATOLOGY

Lectures on Haematology. Edited by F. G. J. Hayhoe, M.A., M.D., M.R.C.P. (Pp. 246; illustrated. 60s.) Cambridge University Press. 1960.

These lectures were given at a postgraduate course in Cambridge in December, 1959. The cover tells us that they are "informative reviews of expanding or controversial topics in haematology, given by workers who have themselves contributed to the advance of knowledge in their respective fields." This is indeed a good description of the contents, and the contributors have for the most part been content to select some aspect of already published work and lecture about that in the expectation that their audience would not be familiar with recent literature. A few of the lectures are worth reading by haematologists too. Thus Professor Dacie reports some interesting cases of haemolytic autoantibodies directed against an Rh group antigen, and Professor W. M. Davidson gives a remarkably succinct

account of our changing ideas on iron metabolism and newer methods of investigation. Dr. R. M. Hardisty gives a clear account of current views about the haemostatic process and the place of the numerous factors in clotting processes, and fortunately there has been little change in the last year; his article is supplemented by Dr. G. I. C. Ingram's on the practical laboratory diagnosis of blood-coagulation disorders, with a few notes on management. Dr. J. C. White provides a notably complete account of haemoglobin variants, their practical importance and the methods used for studying them. Dr. H. E. M. Kay reviews the published accounts of attempts to treat leukaemia by marrow transplantation and warns us not to pitch our hopes too high. The other seven lectures are on more familiar lines.

The book is well produced and there are some interesting plates. But the price is high, and surely few private persons will wish to spend £3 on a book that contains little new and which they will not often consult after a first reading. A less expensive format might well have interested more readers.

M. C. G. ISRAËLS.

MEANING OF STRESS

Stress and Psychiatric Disorder. The Proceedings of the Second Oxford Conference of the Mental Health Research Fund. Edited by J. M. Tanner, M.D., D.Sc. (Pp. 151; illustrated. 21s.) Oxford: Blackwell Scientific Publications. 1960.

This book records the proceedings of the second international conference convened by the Mental Health Research Fund, held at Oxford in July, 1958, with the object, as Sir Geoffrey Vickers said in his opening address, of clarifying how the concepts of "stress" and "stressor" are used by psychiatrists, students of animal behaviour, and physiologists. Distinguished workers from these fields gave an account of their investigations of stress reactions, from E. Lindemann's study of bereavement as "a special form of social stress" [*sic*] to H. S. Liddell's report on induced "neurotic illness" in sheep and goats, from E. J. Anthony's investigation of the background of stresses of sleep disturbances and encopresis in childhood, to H. Hoagland's account of the responses of the adrenal cortex and medulla, and Hans Selye's discussion of stress in relation to diseases of adaptation in the broader terms of "In which disease has the endocrine status a decisive influence?"

H. G. Wolff in a challenging paper put forward the thesis that "there is no basis for assuming that illness may be divided into psychosomatic and other illness, except in the most superficial sense . . . the majority of symptomatic illnesses, medical, surgical, and psychiatric, arise in or may be remarkably influenced by environmental circumstances perceived by the individual concerned as threatening." He even suggested that the brain itself "in integrating highest level adaptive responses, may be damaged as a consequence of improper interaction between organism and environment, more particularly interaction between one human creature and others." Viewed in this light mental illness is merely a disease of maladaptation to be treated by changing "the reactivity to stresses artificially, either by physiological means or by the action of pharmacological agents" (surveyed by W. Linford Rees) or by "psychosocial means" (J. D. Sutherland).

Taken to its ultimate conclusion psychiatry itself may be expected to dissolve into neurophysiology on the one hand and sociology on the other. In the meantime, however, the clinician must continue to endeavour to understand each patient's mind, for, as Denis Hill pointed out, "every event is only a stressor by reason of the *meaning* which it has for the individual who experiences it." This fact does not detract from the interest of ancillary lines of biological, physiological, and sociological investigation of the effects of "stress" sketched in this volume.

RICHARD A. HUNTER.

SEX DIFFERENTIATION

Sex Differentiation and Development. Proceedings of a Symposium held at the Royal Society of Medicine, April 10–11, 1958. Memoirs of the Society of Endocrinology No. 7. Edited on behalf of the Society by C. R. Austin. (Pp. 198+x; illustrated. 45s.) Cambridge: Cambridge University Press. 1960.

This volume of the now firmly established *Memoirs of the Society for Endocrinology* is certainly one of the most important of the series. It records the proceedings of a conference held in London in April, 1958, to survey the current knowledge on sex determination and its implications. Four main topics receive attention: mechanisms of sex determination, differentiation of germ cells, manifestations of sex, and sexual anomalies. Of great value is the fact that the approach is comparative, ranging from sex in bacteria and mammalian cells to physiological and morphological aspects of sex in insects, crustaceans, fish, higher vertebrates, and Man. Of particular interest to clinicians are a discussion of the possibility of controlling the sex ratio in animals and Man, and some of the intersexuality syndromes of clinical medicine. Much of the information has not previously been published, and many new and fascinating perspectives are opened up by the comparison of ideas developed under such widely different disciplines.

This fine book should be of great value to all zoologists, physiologists, and clinicians interested in problems of sex, reproduction, and fertility.

G. I. M. SWYER.

DISTRICT NURSING

A Hundred Years of District Nursing. By Mary Stocks. (Pp. 229; illustrated. 25s.) London: George Allen and Unwin, Ltd. 1960.

While of particular interest to the medical or social historian and the administrator, this book will also shed light on the origin of some of the controversies which still concern medical officers and nurses to-day. In forthright style Mrs. Stocks traces, from the imaginative action of one man, the growth of a service now nationally recognized as essential.

William Rathbone, of Liverpool, whose first wife, dying of consumption in 1859, had been attended by a hospital-trained nurse, realized what a difference skilled nursing care had made in a home where every comfort could be provided. He began to think what illness must mean in the homes of the sick poor. His action was to engage the nurse, Mrs. Mary Robinson, for three months, to nurse poor patients in their homes in one district of Liverpool, providing food and drugs himself. After a month she begged to be released—the misery she had to see was more than she could bear. But, continuing, she found "the good she was able to do and the response of her patients fully compensated for the misery she encountered."

Gradually others realized the appalling need or were forced to take action by local epidemics of cholera or other diseases. The names of Miss Nightingale, giving

advice and information, Mrs. Ranyard, introducing Biblewomen nurses in the Seven Dials area of London, and other pioneers are followed by various schemes scattered throughout the country, until, in 1888, Queen Victoria's Jubilee Fund was used to found the Queen's Institute of District Nursing (as it is now known). The object was to provide and maintain nurses of excellent character, good education, and with special training in district and maternity care, for the sick poor in their own homes.

The main part of the book then deals with the complexities of administration of a service, expanding in response to need and through years of great social change, while demanding a consistently high standard of work based on specific training, followed by supervision —the essentials of policy of the Queen's Institute, sponsors of this book. Contemporary letters and reports keep the account alive, and some scathing medical comments in the early chapters are followed by more encouraging ones later. But the author does not seem disheartened when prophesying that "the pattern of district nurse training will remain chaotic and wholly illogical, allowing as many people as possible to go their own way, leaving room for experiment by those who want to go a little further than the rest."

Under the title, "The Battle for Training," the story is brought up to date with the Working Party reports, the Minister's Advisory Committee, the integrated course of training for student nurses in London, and finally the residential staff college in Liverpool for district nursing teachers and administrators.

But what of the district nurses and their present-day work? Gone are the cholera and scarlet fever nurses of the past and much, but not all, of the misery. But no clear picture emerges of the domiciliary nurse of the future, who must be concerned with mental as well as physical health, prevention of illness and health teaching rather than dirt, poverty, and premature death. Occasional glimpses are given of the desperate straits of the sick poor of 100 years ago and, by contrast, the injection courses to-day. But the nursing and medical story of the past century has yet to be written. One may ask how far the medical profession as a whole (as distinct from the family doctor with whom the district nurse works so closely) has contributed toward, or has failed to support adequately, the progress of this personal yet national service, which has aroused world-wide respect and admiration.

M. L. WENGER.

BOOKS RECEIVED

Review is not precluded by notice here of books recently received.

Forgotten Men. A Study of a Common Lodging House undertaken by the London Council of Social Service at the request of the Calouste Gulbenkian Foundation. (Pp. 91. 5s.) London: The National Council of Social Service (Incorporated). 1960.

Technique of Fluid Balance. Principles and Management of Water and Electrolyte Therapy. By Geoffrey H. Tovey, M.D. (Pp. 115+viii; illustrated. 15s.) London and Edinburgh: Oliver and Boyd. 1960.

Mental Retardation. Proceedings of the First International Medical Conference at Portland, Maine. Edited by Peter W. Bowman, M.D., and Hans V. Mautner, M.D. (Pp. 530+xiv; illustrated. $12.50.) New York and London: Grune and Stratton, Inc. 1960.

Book of Bodily Exercise. The Earliest Printed Book on Exercise by a Physician. By Christobal Mendez. Translated by Francisco Guerra. Edited by Frederick G. Kilgour. (Pp. 122 +xxvii. $10.) Connecticut: Elizabeth Licht. 1960.

Transactions of the American Ophthalmological Society. 94th Annual Meeting, 1958. (Pp. 730+xvii; illustrated. £7 4s.) Toronto University Press. London: Oxford University Press. 1960.

General Cytology. By E. D. P. De Robertis, M.D., W. W. Nowinski, Ph.D., and Francisco A. Saez, Ph.D. 3rd edition (Pp. 555+xvi; illustrated. 70s.) Philadelphia and London: W. B. Saunders Co. 1960.

Obstetrics. By J. P. Greenhill, M.D., F.A.C.S., F.I.C.S.(Hon.). From the original text of Joseph B. De Lee, M.D. Twelfth edition. (Pp. 1098+xiv; illustrated. £5 19s.) Philadelphia and London: W. B. Saunders Company. 1960

The Golden Scalpel. By Seymour Kern (Pp. 246. 16s.) London: Frederick Muller Limited. 1960.

The Practitioner's Handbook. Edited by William A. R. Thomson, M.D. (Pp. 711+xxiv. 63s.) London: Cassell and Co., Ltd. 1960.

Rudolf Virchow Medical Society in the City of New York, N.Y. Jubilee Volume, 100th Anniversary. Edited by Joseph Berberich, Henry Lax, Rudolf Stern. (Pp. 522; illustrated. No price.) Basle and New York: S. Karger. 1960.

Verhandlungen der Anatomischen Gesellschaft auf der sechsundfunfzigsten Versammlung in Zürich vom 8 bis 12 April, 1959. Edited by Max Watzka and Hermann Voss. (Pp. 482+viii; illustrated. No price.) Jena: Veb Gustav Fischer Verlag. 1960.

Mackie and McCartney's Handbook of Bacteriology. A Guide to the Laboratory Diagnosis and Control of Infection. Edited by Robert Cruickshank, M.D., F.R.C.P., D.P.H., F.R.S.E. Tenth edition. (Pp. 980+xi. 40s.) Edinburgh and London: E. and S. Livingstone Limited. 1960.

III Congreso Hispano-Lusitano de Cardiologia. Universidad Internacional Menéndez Pelayo, 7, 8, 9 setiembre. (Pp. 408+ xxiii; illustrated. No price.) Santander. 1959.

The Eye in General Practice. By C. R. S. Jackson, M.A., B.M., B.Ch.(Oxon.), D.O.M.S., F.R.C.S.Ed. Second edition. (Pp. 152+vii; illustrated. 21s.) Edinburgh and London: E. and S. Livingstone, Ltd. 1960.

Bases Anatomo-Patologicas da Constituicão Psicopatica e sua Interpretacao Patogenica. By Ruy Piazza. (Pp. 107; illustrated. No price.) São Paulo. 1958.

Die chronische progressive Asthenie. Ärztekonferenzen der Internationalen Föderation der Widerstandskämpfer. Volume 1. (Pp. 81. No price.) Vienna: Internationale Föderation der Widerstandskämpfer. 1960.

Autres Séquelles. Conférences Médicales de la Fédération Internationale des Résistants. (Pp. 208. No price.) Vienna: Föderation der Widerstandskämpfer. 1960.

Effect of Vitamin-E Deficiency on the Central Nervous System in Various Laboratory Animals. By Larus Einarson and Ira R. Telford. (Pp. 81; illustrated.) Copenhagen: Royal Danish Academy of Sciences. 1960.

General Endocrinology. By C. Donnell Turner, Ph.D. Third edition. (Pp. 511+xi; illustrated. 66s. 6d.) Philadelphia and London: W. B. Saunders Company. 1960.

Rehabilitation. "From Incapacity to Capacity." Proceedings of a three-day residential course convened by the British Council for Rehabilitation, July 12-14, 1960, Dublin. (Pp. 50. 7s. 6d.) London: British Council for Rehabilitation of the Disabled. 1960.

Bases Anatomo-Patologicas da Constituicão Epileptica. By Ruy Piazza. (Pp. 78; illustrated. No price.) São Paulo. 1958.

Das Gesundheitswesen der Tschechoslowakei. By Rudolf Urban. (Pp. 197+vi; DM. 12.) Marburg/Lahn. 1959.

Précis de Proctologie Infantile. By A. Bensaude and P. L. Chigot. With the assistance of A. Robert. Foreword by Raymond Turpin. (Pp. 120. N.F. 11.50.) Paris: L'Expansion Scientifique Française. 1960.

Clinical Bacteriology. By E. Joan Stokes, M.B., F.R.C.P. Foreword by A. A. Miles, C.B.E., M.D., F.R.C.P. (Pp. 309+x. 30s.) London: Edward Arnold (Publishers) Ltd. 1960.

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BRITISH MEDICAL JOURNAL
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REDUCING RADIATION DOSAGE

In recent years, and especially since publication of the Medical Research Council's report,[1] the hazards of radiology have attracted special attention. But more precise knowledge of them was needed to guide the physician who has to balance the benefits against the risks for any individual patient. Consequently the Committee on Radiological Hazards to Patients was set up under Lord Adrian, O.M., F.R.S., in 1956 by the Minister of Health and the Secretary of State for Scotland to examine the question and make recommendations. Its first report appeared last year,[2 3] and the second (summarized at p. 1727 of this journal) last week.[4]

The committee had first to estimate the amount of radiation the population received from medical sources. In its first report[2] the committee evaluated the dose from mass miniature radiography and attempted to draw up a profit-and-loss account, from which it deduced that at present the gains from this form of radiological examination far outweigh the potential losses. In its second report the committee calculates the genetic dose to the population of Great Britain from a formidable collection of measurements. It is found to be 19.3 mr annually per person, compared with the inescapable dose from background radiation of about 100 mr annually. The dose from radiology is perhaps lower than expected and much lower than in other countries of advanced civilization for which estimates have been made. The reason for its being lower than predicted is possibly that, since the hazard was identified by the Medical Research Council,[1] many hospitals and radiologists have restricted the amount of diagnostic radiology as much as was practicable.

The Adrian Committee not only reviews the situation in 1957 and 1958, the years of its survey, but gives the reports of its clinical panels on the problems in particular fields of diagnostic radiology and radiotherapy. Thus, although the whole report is good educational reading for anyone in the medical and dental professions, probably the section needing closest attention is the 2½ pages on "Recommendations." These are directed in part to every doctor who sends patients to the radiologist, in part to the radiologist.

The general recommendation is that there should be clear-cut indications for any *x*-ray examination. A carefully taken history may indicate that appropriate *x*-ray records already exist. Administrative action must be taken to permit the existing films and records to be available to the doctor needing them. Adequate preparation saves much ineffective radiological examination and therefore saves unnecessary repetition of dosage. Special precautions should be adopted for pregnant women, and in fact for any woman of child-bearing age who could be pregnant, for the embryo is somatically at its most radiosensitive before the mother's pregnancy often is suspected. However, at any stage of pregnancy, irradiation of the mother's abdomen involves irradiation of the foetus—that is, a double genetic dose. According to the survey, at present one-quarter of the population's annual genetic dose is due to irradiation of foetuses. Again for genetic reasons extensive or repeated radiological examination of children and adolescents needs special consideration. As to radiotherapy, the report recommends always giving thought to alternative methods of treatment for non-malignant conditions.

The radiologist is recommended particularly to avoid unduly large field sizes and to ensure that the beam is not directed unnecessarily at the gonads; these should be shielded whenever possible. Mechanical devices should be developed to immobilize children and those adults needing support. Advantage should be taken of technical improvements which can reduce dosage, such as high-speed films and screens and automatic timing devices—and particularly up-to-date *x*-ray equipment. This will cost money, but it will be well spent. Fluoroscopy is to be avoided when the same information can be obtained from radiography, and when this is not possible everything must be done to reduce the time of exposure and thus the dose of radiation; more general use of image-intensification is recommended. Just as the equipment must be first-class, so must the staff in radiological departments be adequate in numbers, intelligence, and training—again partly a question of finance.

[1] Medical Research Council. *The Hazards to Man of Nuclear and Allied Radiations*, 1956. Cmd. 9780. H.M.S.O., London.
[2] *Radiological Hazards to Patients*. Interim Report of the Committee, 1959. H.M.S.O., London.
[3] *Brit. med. J.*, 1959, **1**, 1232.
[4] *Radiological Hazards to Patients*. Second Report of Adrian Committee, 1960. H.M.S.O., London. Price 6s.

Much can be done at once, for the committee calculates that, if all techniques were raised to the standard of the 25% of hospitals showing the lowest doses, the annual genetic dose from diagnostic radiology could be reduced from 14 to 2 mr. The committee could not calculate precisely what reduction of dose might be effected from improvements in radiotherapy of non-malignant conditions, but suggested that it too could be significant.

NOISE IN INDUSTRY

A simple and comprehensive definition of noise is that it is unwanted sound. It conveys our sense of the nuisance value of noise, but perhaps does not sufficiently impress on us the harmful effects of noise. Two recent articles[1 2] of considerable importance draw attention to the effects of noise in industry, and the means by which noise in factories and buildings can be reduced. Noise in industry, it should be stressed, does not necessarily mean business; it may, indeed, mean eventually a socially handicapping deafness for employees. The deafness is not always incapacitating in employment; if it were, employers, faced with claims for compensation, would be more alert to it in factories and workshops. But the problem is not a simple one. E. D. D. Dickson[1] discusses the difficulties in merely assessing, in any individual case, the responsibility for industrial deafness.

The incidence of acoustic trauma is unknown in Great Britain. Although this type of deafness, the result of a noisy occupation, has been known for many years to occur, for example, in boiler-makers and riveters, it is only recently that serious thought has been given to the relation between exposure to noise and changes in the inner ear, with loss of hearing. Many factors, however, are involved—for example, advancing years, previous ear infections, infectious disease in childhood, past head injuries, progressive nerve deafness, and otosclerosis. It is doubtful if a good estimate can be made of what loss of hearing can be expected in advancing years. In the early stages of deafness due to noise the loss of hearing is confined to the little-used high frequencies, and so the attention of neither the worker nor the management is roused.

Legally, occupational deafness is a new concept in the pattern of workmen's compensation. At present only deafness resulting from an accident is compensated under the Act. But now important questions may have to be considered. What noise levels are injurious? What method of determining the employee's hearing loss, resulting from his occupation, is to be accepted? What hearing losses are disabling? What criteria should be used in defining disability? How should we deal with the problem of accrued liability? In Great Britain compensation is at present only admissible if there has been termination of employment or loss of pay. In the U.S.A. some of the states have now made it possible to provide workmen's compensation for occupational deafness, but the medical difficulties in assessment are considerable and not yet finally determined.

In any programme for the conservation of hearing in industry there must be two main objectives—namely, the preservation of the ability to hear, and protection against unjustified claims for workmen's compensation. The first objective must imply pre-employment examination and testing. This ensures that the employer knows at least the amount of hearing loss, should it occur five to ten years later, for which he is likely to be held responsible. Subsequent periodic hearing tests will depend on the amount of noise to which the employee is exposed. Generally, the employee exposed to a noise level of 85 decibels throughout the speech range for many hours a day, five days a week over a period of years, should be subjected to regular tests of hearing. Above this level of noise throughout the speech range, the need is greater for the reduction of noise, the testing of hearing, and the protection of the individual.

When considering personal protection from noise two points need stressing: cotton-wool gives the lowest protection, and comfort is the paramount consideration in inducing workers to begin and to continue wearing some form of ear protection. Individually fitted muff protectors are probably the most practical, and their presence and fitting can be easily and quickly noted by an overseer, an essential point in any scheme. When the background noises are above 85 decibels, the intelligibility of speech, both for communication and warning, actually increases if ear protectors are worn. On the practical side much worthwhile work has been done by the Factory Building Research Committee. The information is available in an admirable publication by A. G. Aldersey-Williams.[2] In it the problems of how to reduce noise by better construction of the factory are discussed in some detail, and the practical solutions suggested should greatly help in the elimination of unwanted and unnecessary noise.

[1] Dickson, E. D. D., *J. Laryng.*, 1960, 47, 408.
[2] Aldersey-Williams, A. G. *Noise in Factories*, Factory Building Studies, 1960, No. 6. H.M.S.O., London.

SIR HOWARD FLOREY, P.R.S.

The election last week of Sir Howard Florey as President of the Royal Society will be warmly welcomed in the medical profession both in this country and all over the world. He is the thirteenth medical man to fill the highest office in the learned world of Britain. Of those medical men elected this century, he follows a notably distinguished line of great scientists—Sir Charles Sherrington, elected in 1920; Sir Frederick Gowland Hopkins, 1930; Sir Henry Dale, 1940; and Lord Adrian, 1950—all of them, as Florey is, Nobel prize-winners. In 1945 it was awarded to him jointly with Sir Alexander Fleming and Professor E. B. Chain for the parts they played in the discovery, isolation, and development of penicillin. If Fleming made the seminal discovery, it was Florey and his colleagues who made the last and important advance which revolutionized the treatment of bacterial infections and opened the floodgates of discovery that released a host of successors to the first antibiotic.

After graduating in medicine at the University of Adelaide (his native city) in 1921, Florey came to Oxford on a Rhodes scholarship. After working there and at the Universities of Cambridge and Sheffield as well as the London Hospital, he returned to Oxford to become professor of pathology in 1935. Elected F.R.S. in 1941, he was awarded the Royal medal in 1951 and the Copley medal in 1957. Apart from his great work on penicillin, which because of the therapeutic revolution it caused must always have a unique place in history, Florey has been an exceptionally skilful experimenter—and on problems that really matter. His pioneer work on mucin was of special interest, for he was the first to make detailed investigations into its production and function in the respiratory and gastro-intestinal tracts, clarifying the part it plays in removing foreign material. In his studies of inflammation he developed special techniques which included the use of cinematography to show how different types of cells react to infection. More recently he has turned his attention to the confused field of atherosclerosis and thrombosis, once again bringing fresh ideas to bear on the problems of the formation and transport of blood lipids. A contribution on coronary artery disease appeared in this journal a few weeks ago.[1]

Britain has had the good fortune to attract many eminent men of science and of medicine from her sister countries in the Commonwealth, especially Australia. They have brought to us a vigour of mind and fearlessness of outlook that have been a great stimulus to those in the home country. Florey has been an outstanding example of the high value to this cross-fertilization of mind and character. And like his fellow countrymen he has never forgotten his homeland, where he returned not long ago to play an active part in setting up the Australian National University, and in particular the John Curtin School of Medical Research. We join with our Australian colleagues in hailing Sir Howard Florey as the new President of the Royal Society.

[1] Florey, H., *Brit. med. J.*, 1960, **2**, 1329.

RADIOACTIVE CONTAMINANTS IN AIR AND BONE

Contamination of infant bones by radioactive strontium was twice as great in 1959 as in the previous year, but the amount of radioactive debris remaining in the stratosphere is now only a small fraction of the total quantity released by the explosion of nuclear weapons since 1945. These are the main conclusions presented in two recent British reports[1 2] on the measurement of bodily and environmental levels of strontium-90. Samples of dust collected at ground level, at the top of the Eiffel Tower, and by filters attached to aircraft have been analysed by D. H. Peirson, R. N. Crooks, and E. M. R. Fisher[1] at Harwell to find the concentrations of strontium-89, strontium-90, caesium-137, and several other radioactive isotopes, including plutonium. Though known as a constituent of nuclear weapons, plutonium-239 has not previously been discussed as a possible hazard in fall-out. Its greatest concentration (in May, 1959) was about 70 times below the maximum permissible level in air for the general population.

Using published figures for the total yield of fission products of nuclear explosions since 1945 and estimating the amount of radioactive dust brought down in rain, Peirson and his colleagues conclude that roughly one-third of the potential fall-out was, at the end of 1959, still in the stratosphere waiting to descend. Another inventory has been made in the United States by means of balloons and high-flying aircraft, which took samples from the stratosphere. These tests indicate that the amount of radioactive material still to be brought down is not much more than one-tenth of the original supply. Both British and American estimates are subject to considerable errors in sampling and extrapolation, but it seems clear that most of the fall-out has now reached the earth. No nuclear weapon tests in the megaton range have been made since the autumn of 1958. In the absence of further large explosions, the stratospheric reservoir may be expected to empty fairly quickly: low-yield tests, such as those made by France in the Sahara during February and April, 1960, will not affect this process.

[1] Peirson, D. H., Crooks, R. N., and Fisher, E. M. R., *Radioactive Fall-out in Air and Rain*, 1960, H.M.S.O., London. Price 7s. net.
[2] Medical Research Council Monitoring Report Series, No. 1. *Assay of Strontium-90 in Human Bone in the United Kingdom—Further Results for 1959*, 1960, H.M.S.O., London. Price 1s. 6d. net.

Meanwhile radioactive strontium continues to accumulate in food chains and in human bones. In the bones of children between the ages of 2 weeks and 5 years, the mean concentration of strontium-90 was 1.4 S.U. in 1958 and 3.05 S.U. in 1959 (1 S.U. or strontium unit = 1 micro-microcurie of strontium-90 per gramme of calcium in the sample). The increase is only partly attributable to the greater deposition of radioactive fall-out resulting from the heavy programme of nuclear weapon tests in 1958. Many foods do not show their maximum contamination for a year or two, this being the time between the growth of the crop and the arrival of the final product at the table. In older children and young people (5 to 20 years) the mean level of 0.9 S.U. in 1959 was not much above the 1958 figure of 0.75 S.U., but among stillborn infants a rise from 0.65 S.U. to 1.15 S.U. was noted. Adult bones continued to show strontium-90 levels of about 0.1 S.U.

If the present lull in weapon testing continues, the level of strontium-90 in infant bones should not rise much further. Accurate measurements will nevertheless remain important for many years, and the enlargement of the monitoring programme, announced in the latest report, is to be welcomed. Until 1959 the group led by F. J. Bryant at the Atomic Energy Authority's Woolwich laboratories were responsible for all of the British measurements. Their contribution of 268 analyses forms the major part of the 1959 results, but two other teams have started work in the same field, with financial support from the Medical Research Council. S. Graham, J. M. A. Lenihan, A. M. Macdonald, and J. M. Warren studied 124 samples in Glasgow, and their results agree closely with those of the Woolwich team. A token contribution of 8 bone analyses made by A. G. Maddock and P. Fawcett gives promise of larger contributions in future years from Cambridge. With this increase in the strontium assay programme it is no longer appropriate for all of the British results to be published in the form of reports from the Atomic Energy Authority. The present survey[2] is the first of a new series of monitoring reports sponsored by the Medical Research Council; they are intended to give factual data at regular intervals, but not to attempt any assessment of the significance of the results.

Most of the 400 samples studied in the 1959 report came from Wales or Western Scotland—regions where the rainfall, and therefore the deposition of fall-out, are above the average. The assay of human bone for radioactive strontium is a task demanding analytical skill and experimental fortitude in good measure, but an extended programme giving more uniform coverage of the United Kingdom is desirable. Other tasks for the future must include continued study of strontium metabolism as a basis for efforts to explain the wide variation of strontium uptake between one individual and another. Current levels of strontium-90 in foodstuffs and in bone do not appear to constitute a significant hazard, but the position will quickly change if hydrogen bombs are ever used in earnest—or even if a large testing programme is resumed.

RESEARCH ON FOOD ADDITIVES

It has often been argued that there should be a body in Britain comparable with the Food and Drug Administration in the U.S.A., the recommendations of which can be legally enforced. All new drugs and food additives must be submitted to it for its approval. This body has the power to ban the addition to food of substances it may consider to be harmful. The sophistication of foodstuffs has become such a fine art that few of them reach the family table without some chemical treatment designed to improve their appearance, taste, keeping qualities, and ease of preparation. A glaring example of this sophistication is bread, which has just been the subject of an official report, on which we commented last week.[1] The effect on human health of "processing" foods has received scant attention. This is partly due to the complexity of the subject, any attack on which needs to be a combined operation, by the nutritionist, clinician, chemist, biochemist, pharmacologist, toxicologist, veterinarian, and agriculturalist.

The formation of a new research organization to study the possible effects on human health of substances added to food, drink, and cosmetics has just been announced. This is most welcome. The organization, which is to be known as the British Industrial Biological Research Association, is being supported by a number of leading companies in the food, chemical, plastics, packaging, and cosmetic industries, and also by certain important distributive concerns. It will receive a grant from the Department of Scientific and Industrial Research equal to the industrial support that it will get up to a total grant of £47,000 annually. This association, which will be an autonomous industrial body functioning as a limited company, becomes the fifty-second research association to receive Government support.

The new association's main object is the establishment of a biological research station for investigating the effect of many substances, both old and new, used in food manufacture during the processing, flavouring, and colouring of the foodstuffs concerned, or that may get into food as a result of contamination from pesticides, from the manufacturing plant used, from packaging materials, or from utensils. Although some of the larger food companies already have research facilities for investigating some of these problems, this will be the first national industrial organization in Britain with responsibility for tackling work of this kind. There is a dearth of information on the effect of food additives on human health, particularly the results of ingesting small amounts over long periods of time. The results of research in this field in other countries will also be studied and interpreted as part of an advisory information service.

So far ninety different companies have guaranteed financial support for the research association, to the extent of £23,000 annually for five years. This sum will be doubled by the contribution of the Department of Scientific and Industrial Research. Representatives

[1] Leading article, *Brit. med. J.*, 1960, 2, 1659.

of the Medical Research Council, Agricultural Research Council, Ministry of Health, and the Ministry of Agriculture, Fisheries and Food will serve on the council of the association, so that it will have a high scientific standing. Laboratories are to be built at Leatherhead, Surrey, at a cost of £56,000 on land leased from the British Food Manufacturing Industries Research Association, which has offered to share some facilities and services in the initial stages. It is hoped that the research station will be fully operative by mid-1962. The research director has yet to be appointed by the council.

INFECT AND INFEST

The word "infest" is sometimes used instead of "infect" when discussing intestinal helminths, but it seems doubtful whether it is really preferable. The meaning of infect as used in this sense and as given in the *Oxford English Dictionary* is "to affect (a person, animal, or part of the body) with disease." To infest sometimes carries with it the implication of an inanimate object being assailed by animate pests, and the same dictionary defines its current use as "To trouble (a country or place) with hostile attacks . . . said of persons (e.g., robbers, pirates), animals (e.g., wolves, vermin, insects), diseases or other evils." Uses of the word to imply that diseases "attack, assail, annoy, or trouble" a person or thing are described as now rare. Even in the time of Dr. Samuel Johnson the connotations of these words seem to have been much the same, for in the sixth edition of his *Dictionary*, 1785, to infect is defined as "to act upon by contagion: to affect with communicated qualities; to hurt by contagion; to taint; to poison; to pollute," while to infest is "to harass; to disturb; to plague."

Two reasons for describing infection with helminths as infestation suggest themselves. The first is that in most infections the infecting organism multiplies within the body, whereas most helminths do not. Against this it may be said that the essential point of infection is that it should be transmissible, and helminthic infections certainly are. Moreover, not all diseases generally denoted by the term infection are caused by organisms which multiply within the body. Thus the filarial worms do not do so, but there has never been any tendency to refer to filarial "infestations." The second point, occasionally made, is that intestinal helminths are not truly inside the body, whereas most infecting organisms are within it. This rests on the argument that the inside of the intestinal canal is outside the body, which may be thought questionable. Consistency and common sense would therefore seem to favour the use of the word infect for intestinal helminths, but traditional usage often has the final say.

THOMAS LINACRE

When the first—and last—attempt at a full-scale biography of Thomas Linacre was published in 1835 it aroused so little interest that its editor destroyed all but a few copies which he set aside for presents. The gap in British medical biography left by this gesture has never been filled, and it is therefore more than an act of piety which the Royal College of Physicians has performed in inviting a distinguished historian, Sir George Clark, to deliver an oration in honour of the quincentenary of Linacre's birth. Summarizing with a wise impartiality all that is known of the personal life and achievements of the great scholar-physician, who was the chief founder and first President and benefactor of the College, the Oration is briefly reported at page 1728 of this journal.

Enthusiastic medical orators have from time to time lauded Linacre as a second Hippocrates, as the originator of scientific medicine in England, and as a forerunner of Harvey. He was none of these. The little that we know of Linacre's medical practice leads us to believe that it could have differed little from that of other physicians of his type in mediaeval Europe or in Rome of the third century A.D. What we do know is that he was a great classical scholar at a time when such attainments were most admired and envied. His long stay in Italy, when he was privileged to study and work with some of the leaders of Italian humanism, gave him a magistral authority in the new learning, so that when he returned home he inevitably became one of the leaders of the Renaissance in England.

The movement which has been so named was precise and limited in its aims and activities. The attempt to produce accurate editions and translations of Greek texts was designed to reveal authority purified of corruption. As was shown by some of the religious reformers with their parallel aims in theology, the new authority could, when challenged, be just as inflexible as the old. The Galenic texts, however perfectly edited or translated, were still no gateway to modern medicine, especially those which attracted the attention of the translators. Indeed, it could be argued that the new lease of life which they gained from the care lavished on them by Renaissance scholars was positively detrimental to medical progress. Whatever it may have owed to the spirit of inquiry liberated by the humanist movement, it is likely that the great scientific renaissance which came to its full flower in the seventeenth century owed as much to the challenging spirit of the Reformation, to the stubborn "doubting Thomases" who insisted on looking for themselves before believing, and to the respect for the individual conscience which characterized the best of them.

To say that Linacre could have done little to establish or advance medical science in England casts no shadow on the present commemoration. Let us praise famous men, by all means, but let us praise them for the right reasons. The learned physicians in England before Linacre's time were so few that only a handful of names have survived in the record. When Henry VIII came to the throne there was no corporate medical body, no professional authority or discipline. That Linacre was able to create the nucleus of order out of the most unpromising material, to persuade a self-willed and gifted young monarch to set the seal on his endeavours, to win the support of the subtle and ambitious Wolsey—and all in the cause of good government—shows him a man of outstanding ability in affairs of state.

This is just what we should expect of a Renaissance humanist, nurtured on Plato's *Republic* and Aristotle's *Politics* and fired with the desire to build Utopia there and then. Linacre was a member of an élite which was aristocratic in temper, but the aristocracy was of the intellect. As a Fellow of All Souls he had not far to seek for a model of the ideal society which he wished to establish for the leaders of his profession. Few of our institutions have followed so unswervingly the course set for them by their founders. Patiently and with dignity, throughout the sixteenth and seventeenth centuries, the Fellows of the College, a small group of the elect, established standards of conduct and practice and defended them zealously against all comers, and even against attempts of the sovereign to encroach upon their rights. The long succession of scholar-physicians who have graced their company right up to our own times and the high respect which they won from society are all witness to the success of Linacre's foundation.

HOSPITAL COSTS

The latest hospital costing returns[1] published by the Ministry of Health for 1959–60 show that more hospitals are now using the main costing scheme introduced in April, 1957. The new returns cover some 350 hospitals, most of them with an annual expenditure of at least £150,000, compared with 250 in the previous year. The great majority of the 2,000 N.H.S. hospitals in England and Wales are, however, still using the less detailed costing scheme, and, though its limitations are recognized, it is a pity that the Ministry has decided to stop publishing these returns, and to substitute a, presumably confidential, exchange between hospital boards of the information they contained.

The returns available for the minority show the customary rise in the weekly cost of treating an in-patient. For the non-teaching acute hospitals, the increase is nearly 8% from £23 14s. 5d. in 1958–9 to £25 12s. But though the weekly cost has also risen in the teaching hospitals, the percentage rise is not so great. In the provincial teaching hospitals, the cost rose by only 4.5%, from £29 9s. 2d. to £30 14s. 11d., and in the London teaching hospitals by 5%, from £34 13s. 6d. to £36 6s. 8d. Among the latter, St. Thomas's once more has the dubious distinction of being top of the costs, with a net in-patient cost per week of £39 19s.; but here again it is interesting to note that the St. Thomas's percentage rise, 3%, is below the average. It thus looks as if the margin between the average costs of the hospitals and those of the most expensive is narrowing.

Further differences are apparent when one examines the items that make up the in-patient cost per week. Most of this is accounted for by ward costs, which are made up of salaries and wages, drugs, dressings, and other direct expenditure, and indirect expenditure such as medical records, catering, heating, lighting, and so on. To this figure of ward costs is added the in-patient share of other hospital expenditure on, for instance, the *x*-ray department and physiotherapy, and from it is deducted "direct credits," which are mainly payments by staff for board and lodging. The interesting feature of this breakdown of weekly in-patient costs is the way the cost of salaries and wages has varied from one type of acute hospital to another. The biggest percentage increase is found among the non-teaching hospitals, where the cost of salaries and wages of those working in the wards rose by 12% between 1958–9 and 1959–60, the salary bill of nurses alone rising by 17%. In the teaching hospitals, the cost of salaries and wages rose by 7% in the provinces and 8% in London, but in St. Thomas's the rise was less than 1%. Moreover, although in all three groups of hospitals the cost of medical salaries rose by a much smaller percentage than that of nurses' salaries, in St. Thomas's their cost actually fell. Thus the general impression gained from these returns is of a levelling up in the in-patient costs of non-teaching and teaching acute hospitals, which perhaps reflects a better distribution of nursing and medical manpower.

[1] Ministry of Health. National Health Service—Hospital Costing Returns, Year Ended 31st March, 1960. Parts 1, 2, and 3. H.M.S.O., London. Price 21s. net.

GHANA'S NEW INSTITUTE OF TROPICAL MEDICINE

The forging of another link between British and Commonwealth medicine was announced in Liverpool on December 6 by Sir Edward O. Asafu-Adjaye, High Commissioner for Ghana. At a luncheon given by the Liverpool School of Tropical Medicine, Sir Edward said that an Institute of Tropical Medicine and Endemic Diseases is to be established by the National Research Council in Ghana in close association with the Liverpool School, whose Dean, Professor B. G. Maegraith, has been appointed consultant to the Ghana Government. The Institute is to be built in the hills outside Accra near the Tetteh Quarshie Memorial Hospital, and will be able to make use of the hospital's clinical facilities. The Institute's main task will be the teaching of postgraduate medical students and research. Courses of training will be given to Ghanaian doctors who have graduated abroad and intend to practise in Ghana. Research will be carried out on local endemic diseases, and the vital statistics of the country will receive special attention. For both teaching and research purposes the Institute and the Liverpool School will maintain close liaison, and it is hoped that at a later stage the School will be able to second members of its staff for short-term projects in Ghana, including lecturing and research, and that there will be some exchange of staff. The School has agreed to take Ghanaian postgraduates and a number of Ghanaian technicians for training.

Professor Wilder Penfield, O.M., director of the Montreal Neurological Institute, has been awarded the Lister Medal for 1960: he will deliver the Lister Memorial Lecture in London on April 5, 1961, under the auspices of the Royal College of Surgeons of England.

DOCTORS' HOBBIES EXHIBITION

[FROM OUR CORRESPONDENT]

People roared with laughter at N. F. Simpson's surrealist play, *One-way Pendulum*, in which one of the characters erects a do-it-yourself Old Bailey in his sitting-room, and then finds himself on trial in it, but after seeing the fourth Doctors' Hobbies Exhibition, sponsored by Benger's, one realizes just how close to the bone of ordinary life surrealism can be. Even Simpson could not have bettered the home-made 17-foot long, two-seater, low-wing monoplane with a wing span of 27 feet which was flown down in easy stages from Rutherglen in Scotland, dismantled, hauled into the courtyard of B.M.A. House, and then put together again.

This was certainly the largest and most ambitious exhibit; the smallest was more difficult to determine. There was the tiny pocket radio assembled in the shell of an old turnip watch and powered by two batteries each no larger than an aspirin tablet, or the agates polished at the Scottish Mineral and Lapidary Club, and gleaming like burn water. Other exhibits stick in the mind: the electrically worked dial and pointer with which handicapped patients can make known their requests; the home trainer to teach correct fingering for typewriting—an eerie exhibit this, with its two stuffed hands hovering over the keyboard; the parking aid—a set of rollers for getting a car out of a tight spot; the intricate model railway; rare aberrations of British butterflies; Holman Hunt's "Light of the World" worked in tapestry wool; the nursery tales in sea shells; the collections of Victorian miniature scent bottles, of Victorian china shoes, of notable signatures, and of chinoiserie—this included a tiny shoe for a bound foot and a gruesome cast of the foot itself. The collection of notable signatures provides an entertaining exercise for those who are interested in the relationship between character and handwriting. There is a letter and signature of Rider Haggard (bold and large), Sir William Jenner's (firm, neat, and flowing), the Duke of Wellington (unexpectedly decorative), and Gladstone (bold, black, but not very legible). The selection of antiques elicited an approving comment from one of the exhibition officials: "Doctors seem to be very antique-minded." The prize entry in the sculpture and woodwork class—"The Prisoner"—a brooding and claustrophobic piece of work, contrasts very effectively with the lighter-hearted "Mother with Difficult Child," an abstract in writing silver and red metal strips. The photography and painting classes again attracted the most entrants, and contained some charmingly tranquil landscapes, as well as one of the most covetable series of photographs in the exhibition—of the austere yet graceful patterns of the twin elliptic pendulum harmonographs.

[*A. Dawson, London W.C.*

Nursery stories in sea shells.

[*A. Dawson, London W.C.*

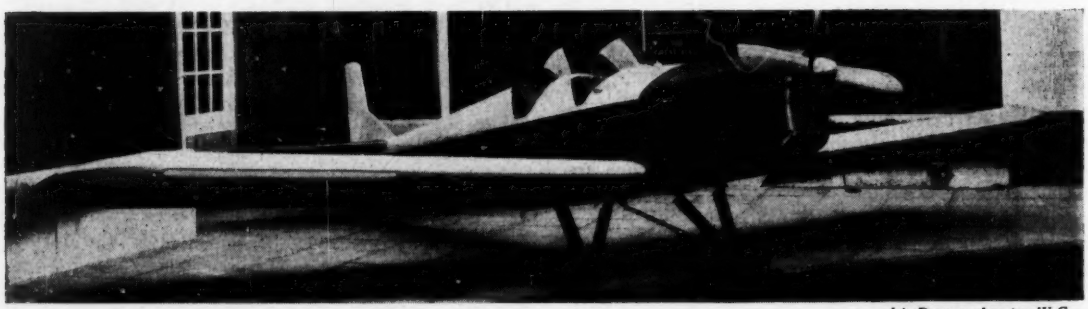
Chinoiserie. Bound foot and shoe.

All in all, one cannot but be grateful for this annual demonstration that, under the conformity and lack of individuality which we are sometimes assured is the inevitable outcome of a National Health Service, Britain's doctors are busily working away like moles at a rich seam of originality and inventiveness.

The first prize of £75 went to Dr. J. L. Jones, of West Mersea, in the inventions section, for his prototype boat which exploits the energy of its own bow wave. Dr. J. E. Rankine, of Romsey, took second prize (£50) with his petit-point evening bag in the embroidery section, and Dr. C. J. F. Coombs, of Perranarworthal, third prize (£25) for his paper in the natural history section on "Observations on the Rook in South-west Cornwall."

[*A. Dawson, London W.C.*

The Prisoner.



[*A. Dawson, London W.C.*

Full-size two-seater low-wing monoplane.

RADIOLOGICAL HAZARDS TO PATIENTS

ADRIAN COMMITTEE'S SECOND REPORT

The second report[1] of the Adrian Committee[2] was published on Wednesday. Below we record the Committee's Conclusions and Recommendations.

The Adrian Committee was appointed by the Secretary of State for Scotland and the Minister of Health at the end of 1956, with these terms of reference: "To review the present practice in diagnostic radiology and the use of radiotherapy in non-malignant conditions, having regard to the report of the Committee on the Hazards to Man of Nuclear and Allied Radiations,[3] and to make recommendations."

The Committee has already produced an interim report,[4] on which we commented[5] at the time. The Committee's present findings are based on three surveys. During a week in 1957 a survey was made of the numbers and types of all *x*-ray examinations carried out, of the number of films used, and of the apparatus available in all National Health Service hospitals and chest clinics, in dental surgeries, and in a few other institutions in Great Britain. A second survey, at a different time of the year, was made on a random selection of a quarter of the National Health Service hospitals and chest clinics. Physical measurements were then carried out of the radiation dose received by patients undergoing different types of radiological procedures in a representative sample of 130 hospitals and chest clinics. These investigations were designed to survey radiological practice in all types of hospitals with widely differing standards of technique. A separate investigation, including a three months' survey, was carried out to estimate the dose contribution from radiotherapeutic procedures. In assessing the results of these surveys the Adrian Committee had the help of 10 specialist panels. A leading article discussing the report appears at p. 1720 in this issue.

Committee's Conclusions

"Our survey shows that all medical radiology in 1957–8, both diagnostic and therapeutic, resulted in a genetic dose of 19.3 mr per person per year. The main contributions to this total genetic dose are derived from diagnostic radiology (14.1 mr), radiotherapy of non-malignant conditions (4.5 mr), and radiotherapy of malignant conditions (0.5 mr), whilst minor contributions are made by the medical uses of radioactive isotopes (0.18 mr), mass miniature radiography (0.01 mr), and dental radiography (0.01 mr). The figure of 14.1 mr for diagnostic radiology in 1957–8, obtained from a nation-wide survey after radiological practice had begun to be influenced by the Medical Research Council's report, is less than that given (22 mr) by the Council for the year 1955. It is also less than the level that has been calculated in other countries with comparable radiological facilities.

"No figure for the contributions from radiotherapy to the genetic dose to the population has so far been available in this country, but the national surveys which we have conducted have now provided a firm basis for the calculation of a figure of 5.2 mr.

"We do not believe that the levels indicated show any need for major restrictions in radiological practice and we are convinced that the number and type of examinations or treatments must be dictated by the clinical needs of the patient. In view, however, of the increasing use of ionizing radiations in the many activities of our present daily life and the greater opportunities for exposure of the population, it is necessary to reduce the gonad dose wherever possible. We are convinced that in many instances of diagnostic and therapeutic procedures this dose could be substantially reduced without any detriment to the efficiency of the examination or treatment. If the recommendations which we have set out below are carried out we are satisfied that the total annual genetic dose to the population from all forms of medical radiology can be reduced to a figure of 6 mr or less.

"Our survey has also shown that in the present circumstances the dose to the gonads from any *x*-ray examination is small in comparison with that considered by the Medical Research Council to be acceptable to the individual without causing any undue concern on behalf of himself or his offspring. The dose will be reduced still further by the adoption of our recommendations. We would emphasize that any possible genetic risk from these doses must be weighed against the undoubted benefits which are conferred upon the individual and the population by diagnostic and therapeutic radiology. We confirm the opinion expressed in our interim report that 'much individual suffering would follow any unnecessary curtailment of those services.'"

General Recommendations

(*a*) "There should be clear-cut clinical indications before any *x*-ray examination is undertaken, and it should be ascertained whether there has been any previous radiological examination which would make further examination unnecessary. For this purpose the case sheet should have a section labelled 'previous *x*-rays.'

(*b*) "To reduce unnecessary examinations, arrangements should be made for the ready availability of previous films and for the routine transfer of films from one hospital to another.

(*c*) "All requests for examinations should state precisely the clinical indications and the information required.

(*d*) "There should be consultation between clinician and radiologist before extensive or repeated radiological examinations of young individuals are undertaken. It must be realized that radiological exposure is just as much the responsibility of the clinician as of the radiologist.

(*e*) "To reduce the necessity for repeat investigation strict attention should be paid to adequate preparation of the patient before abdominal investigation.

(*f*) "Special precautions should be adopted in the radiography of pregnant women. Only essential examinations should be carried out during pregnancy and particular care should be taken to avoid irradiation of the foetus whenever possible. In all women of child-bearing age the clinician requesting the examination should never overlook the possibility of early pregnancy.

(*g*) "Any previous history of radiotherapy should be ascertained before a new course of treatment is undertaken. Permanent records of all radiotherapy should be maintained and be readily available for transfer from one hospital to another.

(*h*) "Consideration should always be given to alternative methods of treatment before radiotherapy for non-malignant conditions is undertaken.

TECHNIQUES

"In every radiological examination, care should be taken to reduce to a minimum the irradiation of the gonads. The steps necessary to this end are discussed throughout the report." (These are then listed in summary form under the Committee's "Recommendations.")

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[1] *Radiological Hazards to Patients.* Second Report of the Committee. 1960 H.M.S.O., London.

[2] Lord Adrian (*chairman*), Dr. L. G. Blair (*appt. August, 1957*), Professor J. C. McC. Browne, Lord Evans, Mr. R. J. G. Grewcock, Professor A. Bradford Hill (*appt. May, 1957*), Professor R. J. Kellar, Dr. Peter Kerley, Dr. D. R. Maitland, Professor W. V. Mayneord, Professor J. S. Mitchell, Mr. C. Naunton Morgan, Dr. Kenneth Robson, Mr. T. Holmes Sellors, Mr. G. R. Seward, Professor F. W. Spiers, Professor E. J. Wayne, Professor Charles A. Wells, and Professor B. W. Windeyer.

[3] *The Hazards to Man of Nuclear and Allied Radiations.* 1956. H.M.S.O., London.

[4] *Radiological Hazards to Patients.* Interim Report of the Committee. 1959. H.M.S.O., London.

[5] *Brit. med. J.*, 1959, **1**, 1232.

EQUIPMENT

"Checks should be made regularly to ensure that all radiological equipment is maintained to the standard laid down in the Code of Practice for the Protection of Persons Exposed to Ionizing Radiations. Obsolete and erratic equipment should be replaced immediately. The development of automatic devices, and particularly those which reduce the risks of human error, should be actively encouraged.

STAFF AND TRAINING

"Attention should be given to the provision at all times of adequate medical and technical staff in radiological departments. In sparsely populated areas where radiologists or radiographers are not available, training in the safe use of equipment should be given to the general practitioners or nurses who have to carry out any minor *x*-ray examinations. Adequate instruction should be given in the medical and dental undergraduate curricula on the uses and hazards of ionizing radiations.

SURVEILLANCE

"The genetic dose to the population from diagnostic and therapeutic radiology should be kept under effective review by the Health Departments."

THOMAS LINACRE

Sir GEORGE CLARK, formerly Regius professor of modern history at Cambridge and provost of Oriel College, Oxford, delivered the Linacre Oration to the Royal College of Physicians of London on December 8.

Although the College, said Sir George, was in form a royal foundation, Linacre had always been rightly regarded as its real founder. He was also its president from the beginning in 1518 until his death in 1524, and he was its first benefactor. His wealth was acquired at least partly from a successful professional career, by the end of which he was head of the medical household of King Henry VIII. Among his contemporaries, however, he was chiefly famous as the first Englishman to make a substantial contribution to the revival of Greek learning, and as the first Englishman with a European reputation as a classical scholar.

Birth and Education

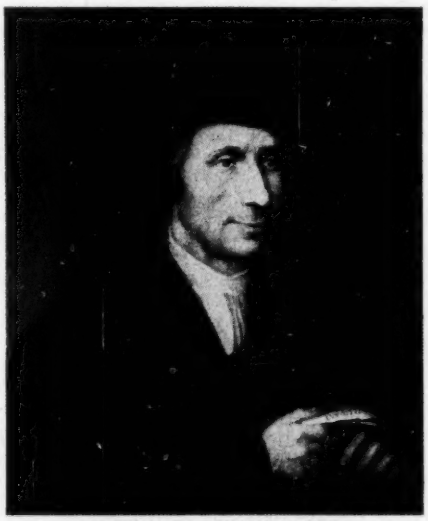
Linacre was born in 1460 or 1461 (the exact date was unknown). He was *Cantuariensis*, but that might mean that he was born not in the city but in the diocese of Canterbury. The first well-attested fact of his life was that he was elected a Fellow of All Souls College, Oxford, in 1484. Whether he began to study Greek or medicine in Oxford was unknown, but there were opportunities in both fields. In 1487 Linacre went to Italy, and it was not until 1499 that he returned to England to settle down. During those years he worked in the inner circles of the revival of learning. In Florence, at the Court of Lorenzo the Magnificent, he learnt Greek from the best masters. In Rome he served for a year as warden of the English hospice. In Padua he took his degree as Doctor of Medicine. In Venice he lived for several years in the house of Aldus Manutius, the greatest of all printers of classical texts. Linacre devoted himself especially to the manuscripts of Greek scientific and medical works. When he left Italy he was a recognized authority on these, and he had completed the first of his works to be published, a Latin translation of the little treatise of Proclus on the terrestrial globe.

Return to England

Back in England Linacre was one of the leaders in the wonderful circle—Grocyn, Latimer, Colet, Erasmus, Thomas More, and their friends—who began the continuous history of Greek scholarship and teaching here. His friends reproached him with being slow to publish; but, in spite of the other calls on his time, his achievement in that line was very considerable. He lectured on the scientific work of Aristotle, but his published work dealt mainly with Galen, who was for that time the most important of the Greek medical writers. Galen's works were published in Greek in five large folio volumes by the successor of Aldus in 1525, but before that there was a period of about 30 years in which the most fruitful method of recovering Galen's medical science was to translate from the manuscripts into Latin. Linacre, with a higher standard of scholarship than most of the translators, dealt in this way with two of Galen's major works, and his translations ranked as standard works, often reprinted in various Continental cities. Besides several shorter pieces of Galen, and a school Latin grammar, he provided other scholars with a valuable tool, a full grammar of the Latin language. This, too, was long and widely celebrated.

College's Original Purpose

Except for one visit to Paris as physician in the suite of King Henry's sister Mary, Queen of France, Linacre spent the years of his prosperity at his house, the Stone House



THOMAS LINACRE (1460/61–1524)
From the portrait in the collection of Her Majesty the Queen at Windsor Castle. For long attributed to Holbein, this is the origin of all subsequent portraits of Linacre. Modern investigations cast doubt on the identification of both painter and sitter.

in Knightrider Street, close to St. Paul's Cathedral. London in his day was exceptional among the greater cities of Europe in having no organized body of physicians. This did not mean that its medical doctors were an undisciplined rabble: they were very few in number and they were bound together by a great ethical and educational tradition. But there was a need for system in granting of licences to practise and for direction in the repressing of irregular practitioners. These were the ends which the College of Physicians furthered. The College was not intended to be a teaching body: for that purpose Linacre conveyed landed estates which he had bought in Kent to trustees who were to establish medical lectureships in Oxford and Cambridge. So far as the London College followed any existing models, it seemed to have adopted some features of English guilds and companies, and some of Florentine, Venetian, and other Continental medical corporations.

Many writers had represented Linacre as a forerunner of the scientific spirit or even of the Protestant Reformation. We knew too little of his mind to guess what he thought of the new religious movements which afterwards divided the circle of his friends. During his lifetime they were

scarcely heard of in England. He was an ecclesiastic; he held many church preferments, and he was ordained priest as late at 1520, when he was about 60. The many-sided Italian renaissance, in which he played more than a minor part, had an element of science in it, but much else too. We did not know whether Linacre ever heard of the anatomical investigations of Leonardo da Vinci, but we did know that he was a fellow-pupil of Pope Leo X. So far as his mind and action were known to us, it seemed that he used his learning and his wealth in the ways that the ideals of his early manhood dictated.

To-day's Drugs

With the help of expert contributors we publish below notes on a selection of drugs in current use.

Corticotrophin

"Acthar," "HP Acthar-gel" (Armour).
"Corticotrophin," "Cortico-gel" (Crookes).
"Cortrophin," "Cortrophin ZN" (Organon).

Composition. — Corticotrophin is the adrenocortical-stimulating hormone (A.C.T.H.). It is elaborated by the anterior lobe of the pituitary and controls the secretory activity of the adrenal cortex. All the A.C.T.H. commercially available is of animal origin, being extracted from the pituitary glands of pigs, cattle, sheep, or whales. The hormone is a polypeptide, and the amino-acid content is known for A.C.T.H. of sheep and pig origin.

The dose of A.C.T.H. is expressed in terms of "units." An international standard has been chosen and the biological effect of any newly made batch of hormone is compared with this standard. Injected into rats, A.C.T.H. stimulates the cortex of the adrenal gland, and the increased secretion of corticosteroids is associated with a decrease in the concentration of ascorbic acid in the gland. It is from this decrease in ascorbic-acid content that the potency of A.C.T.H. is measured.

When injected into human beings, A.C.T.H. is rapidly absorbed, but is destroyed in the blood stream and at the site of injection by certain proteolytic enzymes. Thus, as with insulin, several different preparations of A.C.T.H. have been made which protect the hormone from destruction at the site of injection and prolong the duration of its action by delaying absorption.

Preparations.—"Ordinary" (lyophilized) A.C.T.H. is a powder readily soluble in water. Given by intramuscular injection it stimulates the adrenal cortex for 6–8 hours. A greater effect is achieved by slow intravenous infusion, and the administration of 75 units over 6–8 hours induces maximum stimulation. Corticotrophin can be made purer by absorbing it on to oxycellulose and then eluting the absorbed material with dilute hydrochloric acid. This "purified" A.C.T.H. is more potent than cruder extracts, and much of the commercial material to-day is basically of this purified type.

Various long-acting preparations are available. These are all given by intramuscular injection; the absorption of the hormone is delayed, with the result that its stimulating action is prolonged.

Pharmacology.—The main effect of A.C.T.H. in man is to increase the adrenocortical excretion of hydrocortisone, but in addition certain other steroid hormones are formed in increased amounts. The resultant effects are similar to those achieved by giving cortisone, hydrocortisone, or one of the other synthetic glucocorticoid steroids (prednisone, triamcinolone, methylprednisolone, and dexamethasone).

Indications.—A.C.T.H. is an invaluable tool for the investigation of adrenocortical function, and is particularly used to confirm adrenal hypofunction in patients suspected of Addison's disease. No standardized procedure has yet been agreed, but the principle of the test is to inject A.C.T.H. over a period of 3–4 days and measure the increase in urinary excretion of adrenocortical hormones that occurs if the gland responds normally. Other more indirect signs of increased cortical secretion, such as a reduction of eosinophils in the peripheral blood, are less reliable.

A.C.T.H. is also used for the treatment, amelioration, or control of those many conditions that respond to corticosteroids. Some workers have claimed that in rheumatoid arthritis better results are achieved with A.C.T.H. than with glucocorticosteroids, but this is not generally agreed, and many patients dislike repeated and prolonged courses of injections.

A.C.T.H. is of no value for the treatment of adrenocortical insufficiency, nor can it be relied upon to prevent adrenal suppression in patients receiving prolonged treatment with glucocorticoids.

Dosage.—The number of units required to produce a given increase in adrenocortical activity will depend on the type of preparation used, the route of administration, and the responsiveness of the patient's adrenal cortex. The greatest effect from the smallest amount of hormone is achieved by slow intravenous infusion. "Ordinary" A.C.T.H. must be injected every 6–8 hours to maintain adrenocortical stimulation. The long-acting preparations usually sustain increased adrenal secretion for a period of 24–48 hours. The responsiveness of individual patients varies and in general it is not possible to define the precise dose needed; rather the amount injected is adjusted to the least that produces the desired therapeutic result.

Side-effects.—Corticotrophin is a foreign protein, and cases of sensitization and even anaphylactic shock have been reported. Prolonged administration, by inducing an increase in adrenocortical excretion, causes many of the side-effects and complications that may occur after long-continued treatment with corticosteroids—symptoms of Cushing's disease, moon facies, striae, reduced glucose tolerance and even diabetes, osteoporosis, acne, hirsutism, an increased liability to infection with suppression of the usual constitutional symptoms and signs, retention of sodium, and increase of blood-pressure. In contrast to corticosteroids, A.C.T.H. is probably less likely to cause peptic ulceration or gastro-intestinal haemorrhage, but more likely to cause retention of sodium, hypertension, hirsuties, and acne.

N.H.S. Basic Price.—Armour Pharmaceutical Co.: Acthar lyophilized (intramuscular or subcutaneous), 10 i.u. vial, 2s. 5d. Acthar lyophilized (intravenous), 30 i.u. vial, 2s. 8d. HP Acthar-gel (intramuscular or subcutaneous), 5 ml. vial 20 i.u. per ml., 20s. Crookes Laboratories: Cortico-gel, 5 ml. vial 20 i.u. per ml., 16s. 9d. Organon Laboratories: Cortrophin (intramuscular or subcutaneous), 3×10 i.u. vials, 6s. 9d. Cortrophin (intravenous), 3×30 i.u. vials, 7s. 6d. Cortrophin ZN, 5 ml. vial 20 i.u. per ml., 17s. These manufacturers supply corticotrophin in vials of other sizes also.

The medical adviser to the British Red Cross Society has prepared a memorandum on the subject of "rescue breathing," and copies have been sent to branch headquarters and detachments. It will be noted that the memorandum is for information only, and is not for inclusion in the syllabus of instruction or examination. Resuscitation by the use of exhaled air has, under ideal conditions, been shown to give excellent results; its wider use in first-aid and the question of instructional procedures are therefore under consideration by the Society, who will be guided by the recommendations of the Medical Research Council, and will agree a policy with the other voluntary first-aid and life-saving organizations. The desirability of conforming as far as possible with the methods used in the Services will also be taken into account. Copies may be obtained from Stores and Supply Department, 14 Grosvenor Crescent, London S.W.1, at 2d. per copy, postage extra.

Correspondence

Because of heavy pressure on our space, correspondents are asked to keep their letters short.

Salary Crisis at Cambridge

SIR,—Your leading article (November 26, p. 1579) is an expression of Association policy as well as a commentary on a particular problem in Cambridge University. The Special Representative Meeting of September 28, 1960, agreed to press for increases in pay for clinical officers in universities (*Supplement*, October 8, 1960, p. 147).

The conflict here is between the University and the Treasury, or so it would seem to a member of the medical profession which has so recently been similarly involved. The Treasury will doubtless prefer the compromise of differential increases for clinical officers to an increase in the basic stipend. On the other hand, the Medical School will suffer if its officers are not paid at levels comparable with those offered by the N.H.S. and by other universities.

The University Senate is divided. Not all clinical teachers may agree to differential increases for their colleagues. Some non-clinical teachers appear to support differential payment of clinical officers, because it would be a step towards an over-all increase in the near future. Others will not support this claim on the reasonable grounds that financial emolument would alter clinical status in the University. These objectors say that small stipends attract the right men and women to teaching posts; this suggests that status is unrelated to material values, which destroys their argument or reduces it to emotional terms. What the opposition wish, and they are right to do so, particularly if they have young families, is an over-all increase in stipend. Only the Treasury is likely to object to this.

There are only 36 clinical officers concerned in this issue; at present they have less financial opportunity than their colleagues in most other faculties. Clinical officers are paid £50 to £100 per annum over the basic stipend, but are denied the chance to augment their incomes by consultation in clinical or other fields. The report on the discussion in the Senate last week[1] suggested that members of other faculties made money in various extra-academic fields. It will be mooted that the right to accept and retain private fees be restored to clinical officers; at present such moneys are paid into a fund administered jointly by the council of the Medical School and the board of governors of Addenbrooke's Hospital. However, the money which could circulate, as private fees, to the benefit of clinical officers would be abysmally small; what private practice there is has been absorbed by the hospital consultant staff. In any case, the ordinance governing the payment of private fees was instituted to discourage members of medical departments from seeking work outside their department; its aim was ethical. To rescind that ordinance would be retrogressive.

Other universities pay stipends to clinical teachers comparable with scales of remuneration in the N.H.S. The University of Cambridge cannot ignore that fact. Time will tell whether the Senate will press for similar, presumably just, increases for all university officers; the vote has been postponed until the Lent Term.—I am, etc.,

Cambridge. T. B. ANDERSON,
Honorary Secretary, Cambs and Hunts Branch, British Medical Association.

REFERENCE

[1] *Cambridge University Reporter*, 1960, **91**, 523.

SIR,—Your leading article, "Salary Crisis at Cambridge" (November 26, p. 1579), prompts me to commit my thoughts to paper. Apart from being a member of the B.M.A., I am also a member of the Association of University Teachers. The agreed policies of these two organizations appear to be quite contradictory, but, in their ways, both are right. The B.M.A. states that all doctors should be paid as such, whilst the A.U.T. believes that all university teachers should be on the same salary scale, irrespective of a medical qualification.

These two points of view are not irreconcilable. In Belfast, I believe, medically qualified people in preclinical departments are employed jointly by the university and the Health Service. If this scheme could be expanded to operate throughout the whole country it would solve the problem. If there is a need for medically qualified preclinical teachers, it must be because of their special ability, by virtue of their training, to teach doctors. If the Health Service wants good doctors to emerge from its teaching hospitals, it is reasonable that part of the cost of teaching in preclinical subjects should be borne by the Health Service.

I must protest at the way the B.M.A. appears to pay far more attention to the inadequate remuneration of "clinical" teachers than it does to the far worse stipend of "preclinical" teachers.

Unfortunately, I am not in possession of the detailed facts, but I hope that this letter will bring them to light in your columns. I understand that there is some variation up and down the country, but usually anatomy and physiology are classed as preclinical, while experimental pathology, pathology, pharmacology, and social medicine are classed as clinical subjects. These departments all employ medical and non-medical personnel, and often work of an identical nature is done in all of them. Moreover, there are many medically qualified preclinical lecturers who are responsible for the safety and well-being of their students in practical classes, and for the administration of drugs to human subjects in both teaching and research programmes. Many also help their clinical colleagues with special investigations. On the other hand, medical graduates in the so-called clinical departments (possibly also including medicine and surgery) may not see a patient from one year to the next. Where is their clinical responsibility? Why differentiate between clinical and preclinical departments?

It is generally accepted that the lecturer grade is the career grade in a university. Allowing for a lecturer to have two children, he could have a salary of £2,200 (preclinical)—compare this with a top salary of £3,900 for a consultant. Assume he does better, and becomes senior lecturer or reader: in preclinical subjects he can get £2,425 or £2,525 at the top of his scale—in clinical subjects, however, the equivalent salaries are £3,200 and £3,500. There is obviously something wrong here. What about a preclinical professor too? He must surely compare with a consultant with a good merit award, but his top salary can only be £3,600.

I understand that if one advertises a "clinical" lectureship, one will get about six times the number of

applicants that one would for a "preclinical" post. Are we too small a body, we preclinical people, for the hierarchy of the B.M.A. to support us as strongly as they support the general practitioners and the consultants?—I am, etc.,

Redditch, Worcs. E. H. L. HARRIES.

SIR,—In the leading article on the present crisis over academic salaries at Cambridge (November 26, p. 1579) it is suggested that Cambridge should accept the present proposals of the University Grants Committee for the remuneration of clinical staff on the grounds that to decide otherwise would be to "threaten the existence of one of the greatest medical schools in this country, let alone, in the first instance, deprive a generation of students of the quality of teaching and inspiration that has been the hallmark of a university which at least has never been known as the home of lost causes."

It is generally known that Cambridge is a *preclinical* medical school and that, for the clinical part of the curriculum, Cambridge men go elsewhere, usually to the London teaching hospitals. What is not so well known, even in Cambridge itself, is that of the six departments (anatomy, physiology, biochemistry, pathology, chemistry, and pharmacology) in which the Cambridge medical student is taught, only in one (pathology) are the staff, as a result of the 1949 concessions and compromise, receiving remuneration at clinical rates. Since 1949 there has been no difference in the salaries paid to the staff of the other five departments from those paid to the non-medical staff of the university.

The medical student at Cambridge has the option of taking pathology as a half-subject for the Natural Sciences Tripos, Part I, in which he *must* take anatomy and physiology as whole subjects in order to gain exemption from the 2nd M.B. examination. It is therefore perhaps justifiable to conclude that whilst a severe loss to the well-being and distinctive character of the Cambridge Medical School would occur if the department of pathology were to close its doors through lack of academic staff, there would be no medical school at all in the absence of departments of anatomy and physiology.

It may be that in the not too distant future there will be a decline in the fortunes of the five departments concerned with undergraduate medical teaching where the staff are remunerated on the same basis as the university teaching staff in general. Opponents of the system of differentials are bound to point out, however, that the history of the past eleven years lends little support to this belief. Since your leading article is not concerned with the position of the teacher in the preclinical group of subjects, as the University Grants Committee makes the division, but solely with the clinical group, the question really resolves itself into whether the university teaching officers in the department of pathology should be remunerated on the same basis as the other medically qualified staff engaged in the instruction of the Cambridge medical student, and thus on the same basis as the university staff as a whole, or on some quite separate basis. In 1949 the university decided, rightly or wrongly, that they *should* be placed in a separate category, and, unless the whole question of preclinical salaries is to be reopened, the remuneration of pathologists remains as the only question to be answered by the university which is directly related to the thesis of your leading article that a disappearance of *clinical* differentials will lead to the decline of the Cambridge Medical School.—I am, etc.,

Emmanuel College, Cambridge. D. H. M. WOOLLAM.

SIR,—The leading article (November 26, p. 1579), "Salary Crisis at Cambridge," gives a very fair summary of the case against salary differences based solely upon subject within a university setting. However, in your discussion you ignore two important points.

Firstly, university salaries, both clinical and non-clinical, though not as good as they might be because of the relative lack of importance attached to education in our society, are nevertheless adequate for a modestly comfortable existence, and it is not to be expected that they will ever compete with those offered for the top jobs in private industry. The reason for this is surely that university life has many attractions which industry cannot offer and which it therefore tries to counterbalance by the inducement of larger salaries. If this argument is correct—and it is one commonly put forward by opponents of a socialist society, amongst whom the B.M.A. has been prominent—then it should still be possible to induce clinicians with an academic bent to accept university appointments even if they were paid only on the same scale as non-medical appointments, because of the intellectual, research, and social advantages of university life; while there would then be a financial inducement to those more concerned with money-making to take posts in non-teaching hospitals.

Secondly, your argument that the higher clinical salaries will be a factor in bringing up non-clinical salaries to the same level ignores several difficulties. For example, there is the medical prejudice that a medically qualified physiologist should be paid more than one who is not, even if the latter has a research degree. No one can reasonably object to extra pay for extra qualifications, but a research degree is just as much an extra qualification as a first medical degree. More important, while there is no very significant difference in pay between teaching-hospital and non-teaching-hospital medical staff, to raise the salaries of non-medical staff in the universities to the clinical level would create, in many subjects, a very wide difference between those holding university appointments and those not so doing. A difference, moreover, which would not by any means always be justified in terms of merit. In some subjects the majority of the outstanding scholars hold university appointments, in others only a minority.

In short, while it might be desirable to raise all university salaries to the clinical level, it would not be desirable or possible to stop there. Many other professional people would have a strong case for a salary increase, but then the cost would be very considerable and some degree of inflation probable. I would myself be prepared to face this, but in your leading article you fail to do so: I suspect because, reflecting the views of most doctors, you do not relish a future in which the doctor will not have a favoured economic and social position relative to the other rapidly growing professional groups.—I am, etc.,

Monyhull Hospital, Birmingham 14. EDWARD GRANT. Clinical Psychologist.

Acute Respiratory Infections in Children

SIR,—It is likely that the 1960's will see the greatest virus hunt in the history of medicine. Probably the unknown respiratory viruses will provide the main quarry, as our extraordinary ignorance of these agents in general practice cannot be allowed to continue indefinitely. At present the diagnosis of "flu" is proffered with only occasional qualms of conscience

to cover any short-term respiratory fever, although we know perfectly well that enteroviruses, adenoviruses, para-influenza viruses, and a whole host of unknown agents may cause signs and symptoms identical with those produced by the influenza viruses. The non-specific nature of the response of the respiratory tract to invading viruses is at last becoming evident, and it is a very optimistic man who would diagnose with confidence on clinical grounds alone the sporadic case of influenza, and even in epidemics outbreaks of influenza and other respiratory agents may coincide.

It is for this reason that the paper on respiratory infections in children by Drs. E. J. C. Kendall, G. T. Cook, and Doris M. Stone (October 22, p. 1180) is greatly weakened by the exclusion from their series of all cases clinically diagnosed as influenza. It would seem that the restriction of the cultural technique to HeLa cells, which are unsuitable for the myxoviruses, has imposed limitations on the field work which are hardly justified by the gain in simplicity in the laboratory. Although the general practitioner is the person best suited to study the natural history of respiratory diseases, any advance in understanding of the aetiological agents in this group must derive from the close co-operation of family doctors and pathologists, and in our present state of knowledge exclusion of any group of patients on clinical grounds alone would not appear justifiable.

The practice of adding streptomycin to the culture fluid when virus isolation is attempted is open to criticism. The Eaton agent is known to be inhibited by streptomycin, and no one can say with any certainty that the unknown viruses we are all seeking are not equally susceptible.—I am, etc.,

Ipswich Suffolk. P. A. T. WOOD.

SIR,—Last winter an attempt was made in the Whittington Hospital, London, to correlate bacteriological, virological, and clinical findings in cases of acute respiratory disease in children. Suitably taken throat and nasal swabs as well as paired sera were obtained whenever possible. Swabs in transport medium were placed initially in vacuum flasks with dry ice and were later transferred to a deep-freeze container to await examination. Dr. C. E. D. Taylor, of the Routine Diagnostic Laboratory, Colindale, kindly agreed to undertake the virological work. In each case an attempt to isolate a virus from the throat swab was made by inoculating HeLa and monkey-kidney cell cultures. In 12 cases fertile hen's eggs were inoculated intra-amniotically also. Complement-fixation tests were carried out on the specimens of serum in respect of influenza A, B, and C, the adenovirus group, psittacosis, Q fever, and the parainfluenza viruses. The streptococcus MG agglutination test was performed also, but was negative in each case.

The cases studied were unselected admissions of acute upper respiratory-tract infections, bronchitis, and bronchopneumonia. Of a total of 37 cases, 14 were admitted in February, 16 in March, six in April, and one in May. Throat and nasal swabs were obtained from all cases, but satisfactorily paired sera from only 21. The ages ranged from 3 weeks to 5 years; the majority were less than 3 years old. Details of the patients who had positive virological findings are set out in the Table. The following observations are made:

(1) It was not possible to predict virological findings from the clinical picture except in one case (KC24).

(2) A virus (adenovirus) was isolated and a corresponding positive complement-fixation test was obtained in only one case (LW9). This was a 5-months-old child admitted with bronchopneumonia who subsequently developed a purulent meningitis. Pathogenic bacteria were not isolated. Complement-fixation tests of probably significant titres were obtained in a further three cases (see Table). Pneumococci were isolated from the throat of one of these (MF36).

(3) The white blood count was of little diagnostic help in this series. In the 26 cases where counts were done on admission a significant neutrophil leucocytosis was found in only three. Treatment with antibiotics before admission may have been responsible for this and for the small number of positive cultures. Most cases had had one or two days' previous treatment. *Staph. pyogenes* was isolated from the throat or nasal swabs from four cases, haemolytic streptococci from two, pneumococci from two, and *H. influenzae* from six. (*E. coli*, neisseria, and *Str. viridans* excluded.) Special care was taken in plating swabs without delay. Excluding two cases of pertussis, a lymphocytosis suggestive of virus infection occurred in four cases. In one, a case of wheezy bronchitis (NA27), adenovirus was isolated from the throat. In another (ST7) the complement fixation tests indicated a recent (asymptomatic) mumps infection in a child admitted with bronchopneumonia and otitis media.

(4) Conjunctivitis was present in one case with positive virological findings, but also in five others.

The findings in this small series are in broad agreement with others already published.[1,2] If there are specific agents responsible for the annual winter crop of wheezy bronchitis, bronchopneumonia, and other acute respiratory tract diseases in young children they have

Case	Age	Clinical Diagnosis	Bacteriology Throat Swabs	Virology Throat Swabs	Serology			White Blood Cell Count	
					Day of Illness	Virus	Titre	Total	%
LW9	5 months	Bronchopneumonia Pyogenic meningitis Conjunctivitis (? cause)	NPI*	Adenovirus Type 2 isolated	2 20	Adenovirus	4 8	7,000	43 Neut. 51 Lymph.
NA27	7 ,,	Wheezy bronchitis	*E. coli*	Adenovirus Type 5				11,900	16 Neut. 80 Lymph.
RR32	4 years	Bronchitis	NPI	Adenovirus Type 2				9,200	56 Neut. 36 Lymph.
MF36	4 ,,	Pertussis	Pneumococci	Negative	13 43	Adenovirus	10 40	45,700	14 Neut. 79 Lymph.
JG29	2 ,,	Bronchitis	Group A Haem. Strep.	,,	2 17	,,	20 ⩾10	14,300	52 Neut. 38 Lymph.
KC24	8 months	Ulcerative stomatitis Labial herpes Laryngitis	NPI	Coxsackie Virus B2	10 30	Herpes simplex	80 80	8,100	34 Neut. 56 Lymph.
Mc37	3 years	Bronchopneumonia Acute heart failure	,,	Negative	5 89	Para-influenza 1	40 20	18,000	95 Neut. 5 Lymph.
SW16	6 months	Bronchopneumonia	,,	,,	26 43	Para-influenza 3	<5 40	Not done	
ST7	4 years	Otitis media Bronchopneumonia	,,	,,	3 37	Mumps	V S <5 <5 80 40	4,100	36 Neut. 52 Lymph.

* NPI = No pathogens isolated.

eluded this investigation. Identical clinical appearances may be associated with the isolation of potentially pathogenic bacteria, viruses, or neither, or the only clue that a virus may have been responsible may be found serologically. The role of these infective agents in producing the illnesses under discussion is not clear.

I would like to acknowledge the help and co-operation of the Central Public Health Laboratory, Colindale, and of Dr. J. M. Alston and his staff, who so readily undertook the extra work at the busiest time of the year

—I am, etc.,

The Children's Hospital, Birmingham 16. C. G. H. NEWMAN.

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Prescribing Costs

SIR,—Congratulations on the publication (November 12, p. 1442) of a stimulating attack by family doctors upon the whole iniquitous business of prescribing costs. Many a younger practitioner, like myself, must marvel that the profession could ever have accepted, in any shape or form, such abasing, politically inspired interference in our work. Fortunately, the question of principles (ever a dead loss against political forces) can here be married both to common sense and a "hard cash" argument. It takes but little imagination to see that it is simply not rational to conceive, in any given practice, an "average patient" whose *medicinal* cost can be divorced from his overall or *gross* cost to the Exchequer, particularly in regard to: (i) hospital treatment cost per annum; (ii) sickness benefits cost per annum.

Time was when bureaucratic Department A would be encouraged to present a pleasing balance-sheet to the Chancellor, quite regardless of how its policies might cause Department B's expenses to soar. But even politicians have now become economically literate, and to permit this state of affairs to continue is sheerest financial humbug. Thus a doctor, whose prescribing costs are 100% above "area average," may prove to be 50% below a (hypothetical) "area average" in regard to (i) number of acute hospital admissions, (ii) claims for sickness benefits within his practice. He then deserves, surely, a testimonial rather than the inquisition he will probably have to face.

I believe that these additional and supremely relevant "area averages" could and should be obtained for little more time, effort, and money than it takes to produce those pathetic documents called *Prescribers' Notes*. No inquiry whatsoever into a doctor's prescribing costs should then ever be permitted without these easily ascertained figures being simultaneously quoted. That will be the day. The day when we can convince politicians, once and for all, that in terms of hard cash alone, and excluding any Hippocratic arguments, good Medicine pays the State. And, personally, I look forward to the day when I no longer have to endure the visits and exhortations of those who convince me only that they know even less about pharmacology than I do.—I am, etc.,

London N.3 A. GEE.

SIR,—The valuable analysis of Drs. Alistair Mair, George B. Mair, and Andrew Taylor (November 12, p. 1442) leads me to question some generally held assumptions about prescribing costs:

(1) *Inexpensive Prescribing is Good Therapeutics.*—It is often suggested that inexpensive prescribing is also sound therapeutics, but what studies verify this proposition? Without them it would seem more reasonable to assume that there is no correlation between prescribing costs and the quality of medical care provided by a general practitioner, just as there is no correlation between the monetary value and the therapeutic value of any particular drug. In Dr. Mair's practice it is apparent that a significant lowering of prescribing costs would entail, not an improvement in the medical care provided, but a deterioration as the authors suggest.

(2) *Measures which Curb Excessive Prescribing will Lower the National Drug Bill.*—The action of the local medical committee to lower the prescribing costs of Dr. Mair's practice is based on the assumption that, if fewer drugs are prescribed, the national drug bill will decline correspondingly. Thus if 50 tablets priced at £1 are prescribed instead of 100 at £2, then £1 will be saved. It is true that this saving would occur in an individual practice; it is not necessarily true that the nation would benefit similarly. This is because most costs in the pharmaceutical industry, as in the Health Service itself, are fixed (overheads), and largely independent of the volume of production.[1] Consequently the price of a drug tends to vary inversely with the quantity used, and the changing price level tends to nullify the effect on total cost both of excessive and parsimonious prescribing.

(3) *Expenditure on Drugs in the Health Service is Excessive.*—The attempts to reduce prescribing costs are based on the assumption that pharmaceutical expenditure in the Health Service is excessive and a heavy burden on the national economy. The available evidence is inconsistent with this view. The cost of drugs prescribed by general practitioners has represented about 10% of the total cost of the Health Service ever since 1948.[2] The share of the national income spent on the Health Service itself is still lower than it was in 1950, and is much the same as that spent on health in Britain in the 1930's.[3] A recent study by the United Nations, although not methodologically perfect, suggests that expenditure both on medical care in general, and on drugs in particular, is rather less in Britain under the Health Service than in many other nations of the Western World.[4]

The practice of good therapeutics is difficult, quite apart from economic considerations. The justification of financial sanctions over doctors who prescribe expensively must either be that they improve therapeutic practice or that they significantly decrease expenditure of public funds. I am not sure that either of these criteria are satisfied.

The real problems of any health service are how to make efficient use of available funds, and how to ensure high-quality medical care. These are complex problems, and it would appear that the persistent efforts to make the N.H.S. inexpensive have done little to solve them.[5]

—I am, etc.,

Richmond, Surrey. J. R. SEALE.

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Electrocardiographs in General Practice

SIR,—The question has arisen as to whether a Health Centre staffed by general practitioners could use an electrocardiograph with profit. It would be interesting to hear the experiences of general practitioners who use E.C.G.s in their practices. Do they find them worth while, are they expensive to maintain, do they wear out

quickly? Would they consider that there are likely to be consequential savings to other branches of the National Health Service? How often do they need to refer tracings to consultants for an opinion? Can a G.P., with practice, learn to interpret the majority of them?—I am, etc.,

114 Regent's Park Road, N.W.1. JOHN W. WIGG.

Haematemesis and Myocardial Infarction

SIR,—I was interested to read the article by Dr. P. Curzen on "Management of Acute Myocardial Infarction Complicated by Haematemesis" (November 19, p. 1489). The association of myocardial infarction and haematemesis may not be entirely one of chance. In the last two years I have had six cases (4 male and 2 female) in which this association has been manifest. None of these were due to treatment with anticoagulants, and in all cases they were not treated with anticoagulants because of the danger of recurrent bleeding. Of these six patients, five recovered, and in the one that did not recover necropsy showed multiple gastric erosions. Of those that did recover, one was shown to have a chronic peptic ulcer at barium meal. The others appeared to have a radiologically normal stomach and duodenum, presumably due to the fact that their acute erosions had healed.

This makes me wonder whether there could be some relationship in these cases between the onset of the myocardial infarction and the associated occurrence of an acute gastric erosion. I also noted that in the case reported in the *Journal* barium meal had shown no abnormality and it had been concluded that haematemesis there had been due to an acute erosion. I should be interested to know if others have observed similar cases.—I am, etc.,

The Royal Hospital, Wolverhampton. S. G. FLAVELL MATTS.

Oxygen for First-aid

SIR,—I was recently called to a patient who had had an acute coronary thrombosis while at work in a large engineering factory. When I arrived I found he was under the care of two nursing sisters who were in charge of the well-equipped works first-aid dispensary. On inquiring whether the patient had been given oxygen I was amazed to find that no such equipment was available. Doubtless tourniquets, splints, bandages, etc., could have been produced in abundance, but the only effective first-aid measure for a failing ventricle was lamentably absent. In these days when coronary thrombosis is so common a medical emergency, surely first-aid staff should be trained to recognize it and be given the wherewithal to apply oxygen.—I am, etc.,

Lindley, Huddersfield. S. L. HENDERSON SMITH.

External Cardiac Massage

SIR,—Your annotation (November 26, p. 1582) is of interest to us as, earlier in the year, we submitted a paper, for publication elsewhere, on "External Cardiac Massage in Children." The state of the thorax in the child renders this procedure an easy one, but in the rigid thorax of older people it may be impossible and damage may be done to the chest cage.—We are, etc.,

Manchester. W. BRYCE MCKELVIE.
London. PETER MCKELVIE.

Diagnosis by Ophthalmic Opticians

SIR,—There are a number of unsatisfactory features of the Supplementary Ophthalmic Service, and one in particular has been causing me considerable concern over the past year or two. The terms of service for ophthalmic opticians provide *inter alia* that when an ophthalmic optician examines a client and finds that he "does not require glasses" or "has an abnormality of the eyes or otherwise requires treatment outside the scope of the Supplementary Ophthalmic Services," or is "not likely to secure a satisfactory standard of vision even if glasses are supplied," he is required to inform the applicant's general medical practitioner. The intention of this report is to supply information to the general practitioner, who will "ordinarily refer the applicant to a hospital or hospital clinic." In the handbook for ophthalmic medical practitioners, ophthalmic opticians, and dispensing opticians issued by the Ministry of Health certain particulars are specified which the optician should quote in his report to the general practitioner "to assist the ophthalmic surgeon at the hospital." So far, so good, and where this system operates precisely in this way it seems to work reasonably well and satisfactorily within its limitations.

On the other hand, however, I have noted an increasing tendency on the part of certain ophthalmic opticians in particular to go beyond what is specified in the handbook, and to make categorical diagnoses relating to the clients they refer, and further than this to venture upon unqualified prognoses quite frequently of a completely h eless nature. Nobody, of course, ever informs an optician whether the diagnosis is right or wrong, and indeed I think it would be very undesirable that any such arrangements should be made, as they would constitute a breach of professional confidence. Inspired by this constant tacit assent, ophthalmic opticians continue to be encouraged as amateur diagnosticians although in fact they are not medically qualified and their knowledge of the diseases of the eye is extremely limited.

A little experience shows that the most ludicrous mistakes in diagnosis are made, and this constitutes a very serious danger as far as the patients are concerned, since general practitioners are always receiving reports about their patients from a wide variety of medical colleagues, and, unless they happen to think seriously about the qualifications behind the statement, they are very liable to accept the diagnosis of the optician without question, and, if he gives a hopeless prognosis, to consider that it would not be worth while putting the patient to the inconvenience of a visit to hospital to see an ophthalmologist, and that no useful purpose would be served by making an apparently unnecessary demand on the heavy waiting-lists for out-patient appointments. This seems to me to constitute a very real and dangerous trap, as in my own experience during the past year or two I have known cases of early and potentially remediable retinal detachment diagnosed by opticians as "amblyopia" and referred back to the general practitioner with the comment that the condition is incurable (!) and a suggestion that he should agree to the provision of spectacles forthwith, and the general practitioner has quite unwittingly complied. I have known of other instances where a similar diagnosis has been applied to cases of glaucoma and other ophthalmic diseases urgently calling for skilled treatment to prevent further deterioration. In consequence of the false diagnosis blandly made by the optician and its unqualified acceptance by the general practitioner, no effectual treatment was obtained for these cases for periods of six months to two years, and in one recent instance the facts came to light only when the patient was brought for blind certification.

The matter is of such importance that the widest possible publicity ought to be given to the danger of diagnoses unhesitatingly made by lay opticians and accompanied by unjustifiable statements on prognosis; and general practitioners should be warned to treat these expressions of opinion with the utmost caution and never to be dissuaded by them from obtaining an opinion from a medically qualified ophthalmologist, since otherwise many cases of potentially remediable conditions will be denied the opportunity for treatment and a great deal of sight will be quite unnecessarily lost. —I am, etc.,

Lincoln County Hospital. ALLAN H. BRIGGS.

Drinking Drivers

SIR,—In the article on "The Drinking Driver" by Dr. Simon Freeman (November 19, p. 1513) and the letter in the same issue from Dr. J. C. Prestwich (p. 1521), reference is made to the importance of lateral nystagmus in the recognition of the drunken driver.

During experiments, which I conducted recently, I did not find nystagmus in men who had taken 4½ pints (2.6 litres) of beer—in fact, the men passed all the B.M.A. tests for recognition of intoxication. I invariably find nystagmus present in the cases I certify as being unfit to drive, and I agree with Dr. Prestwich, who regards nystagmus as indicating a gross degree of drunkenness and incoordination. It is important, however, to remember that Goldberg[1] found nystagmus disappearing at concentrations of blood alcohol of over 300 mg./100 ml.—approximately 9 pints (5.2 litres) of beer. The absence of nystagmus after drinking 4½ pints of beer is of interest in view of the fact that the B.M.A. Committee on Alcohol and Road Accidents stated[2]: "It [the committee] cannot conceive of any circumstances in which it could be considered safe for a person to drive a motor vehicle on the public roads with an amount of alcohol in the blood greater than 150 mg./100 ml." This figure is translated as the equivalent of 4½ pints of beer.

I would like again to emphasize what I said at the A.R.M. in Torquay—namely, that clinical tests are entirely unreliable as tests for the recognition of intoxication. The main purpose of clinical tests is to exclude organic disease, and doctors can avoid a great deal of criticism if they report merely what they find on examination and not what they assume to be present. A good solicitor can obtain the acquittal of every person brought before the court on a charge of driving under the influence of drink. All that is necessary is to introduce an element of doubt into the medical evidence and British law demands that the defendant be given the benefit of the doubt. The best possible defence for the accused is for him to say to the police surgeon that he had not felt well all day but did not see a doctor or take any drugs. Alternatively he may say that he had a touch of Ménière's disease or a recurrence of acute migraine. In the absence of biochemical tests it is a waste of time to certify a driver who has had even slight head injuries.

It is indeed comforting to know that the B.M.A. report *Relation of Alcohol to Road Accidents* has been studied by our progressive Minister of Transport and that the possibility of new legislation was mentioned in the Queen's Speech.—I am, etc.,

Aberystwyth. JOHN H. HUGHES.

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SIR,—Dr. J. C. Prestwich's letter (November 19, p. 1521) calls for a reply. His letter must bring the accusation of "special pleading." The B.M.A. Handbook on the *Recognition of Intoxication* is excellent, and most experienced police surgeons use it as a guide—which is the purpose for which it was intended. At the same time I have known counsel for the defence use it as though it was "the Laws of the Medes and Persians" when it was to their advantage.

Dr. Prestwich omits to mention that the pulse rate should be taken at the beginning and end of the examination. I think he must agree that a pulse rate of 100 at the beginning and end of an examination lasting from 20 minutes to 1 hour (in the absence of disease) may be of use to the police surgeon in making his final decision. The presence of *fine* lateral nystagmus is a most important sign and often an early one. No experienced police surgeon would dream of using this test to "the point of strain" as Dr. Prestwich suggests.

Lastly, doctors called by the accused should try to avoid bias for the defence, as all police surgeons must try to avoid bias for the prosecution. Doctors should concentrate on the medical examination, and, if called by the accused, should satisfy themselves primarily that the police surgeon's examination is fair and reasonable. The police surgeon's task is often difficult enough without the doctor called by the accused taking up an antagonistic attitude, even to the extent (as has happened) of advising the accused to refuse a urine test. —I am, etc.,

Scarborough. N. WALSH.

Natural Gas

SIR,—Surely Dr. A. E. Mourant (November 26, p. 1597) is unnecessarily alarmed at the increase in the use of natural gas to provide town gas? If he studies the annual *Reviews* of the Registrar-General over the past few decades he will note that the suicidal use of coal-gas has remained practically stationary. Not so, however, the use of barbiturates and aspirin, which show alarming increase. Coal-gas has been a long-established favourite of suicides, but the number of cases has shown no sign of increasing although natural gas has long been used either to fortify a poor-quality town gas or, in its re-formed state, as town gas.

Natural gas is practically pure methane (CH_4) and obtained its name from the fact that it is got from "deposits" in the earth—usually where oil is found. Methane is also obtained from coal-mines, where it rejoices in the name of "fire-damp." It is also obtained by the digestion or fermentation of sewage and has, from both these sources, long been used in town gas supplies. Butane (C_4H_{10}) is not natural gas and is normally obtained from the treatment of oil in refineries. It offers the same facilities for suicide as does coal-gas. Methane, used in its original state, also offers these facilities plus the extra hazard of violent explosion should a methane–air mixture come about with methane as low as 5%. We already have this risk in our persons, as methane can be produced in the human stomach by fermentation—leading to explosion, as when some unfortunates have eructated whilst lighting a cigarette[1] (up to 6.8% of methane and 56% of carbon monoxide have been recorded in the human stomach[2]). To use natural gas in its original form would therefore present increased hazards and also call for nation-wide alteration of burning apparatus in homes and factories. To get the story right, natural gas is re-formed by treating it

with steam in the presence of a catalyst, to form hydrogen and carbon monoxide. This resulting mixture is then fortified by the addition of natural gas to bring it to the desired calorific value.[3] Tetrahydrothiophene (T.H.T.) is added to the resultant gas to give the characteristic and unpleasant warning odour.—I am, etc.,

London W.C.1. JAMES LAWRIE.

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Arthrodesis of the Great Toe

SIR,—Mr. F. R. Zadik (November 26, p. 1573) is to be congratulated on his results of metarso-phalangeal arthrodesis for hallux valgus. Nevertheless, it is doubtful whether arthrodesis is better than the well-tried Keller operation for routine hallux valgus. Most patients walk ten days after the Keller, and can look forward to wearing high heels on special occasions. In hallux rigidus, the Keller operation seldom produces a mobile toe, and arthrodesis is the procedure of choice.

Mr. Zadik states that in 18 of 110 feet operated upon, the Pidcock pin, used to fix the joint, was extruded. To avoid this complication I recommend using instead a beef-bone peg. This fits securely into a drill hole slightly smaller than itself, and the square head so convenient for the punch is cut off flush with the phalanx. I have not seen any loosening of such a peg.—I am, etc.,

Maidstone. EDMUND SHEPHARD.

Phenylbutazone and Leukaemia

SIR,—I was extremely interested to read the article by Dr. R. H. D. Bean, "Phenylbutazone and Leukaemia" (November 26, p. 1552), as we have just discharged from this hospital a patient who had a very unusual toxic reaction almost certainly due to phenylbutazone.

The patient was a woman aged 69 years who was treated with 300 mg. daily of phenylbutazone for an arthritic condition of the neck for four weeks prior to her admission to hospital. During this time the only other drug she received was a mixture of colchicum and sodium salicylate for two days, two weeks before she was admitted—that is, in the middle of the course of phenylbutazone—but this was stopped due to gastric symptoms. Ten days before admission she developed a fleeting rash with some enlarged glands in the neck. Five days before admission her temperature rose to 102° F. (38.9° C.), she developed a sore throat, and the rash returned and gradually worsened until she was admitted to hospital.

On admission she was found to have a generalized maculopapular rash, purpuric in parts, and worse on the trunk and limbs. Her temperature was 102° F., and enlarged glands were present in the neck, axillae, and groins. The spleen was enlarged and palpable. There was no ulceration in the mouth or throat. Blood examination: haemoglobin 89% (12.99 g.), white count 27,000 per c.mm. (neutrophils 22%, eosinophils 4%, lymphocytes 66%, monocytes 8%). Many atypical mononuclears closely resembling glandular-fever cells were seen and also occasional myelocytes. Paul–Bunnell test was negative. During the next ten days her temperature swung around 101 102° F. (38.3–38.9° C.) and the rash showed no change, and during this time she was very ill.

One week after admission the white count was 23,000 per c.mm. and the film showed little change: the Paul–Bunnell was still negative. Two weeks after admission the rash started to fade and the white count was then 18,000 per c.mm. with a polymorph leucocytosis, the cells being otherwise normal, and her general condition had started to improve. Finally on discharge, about one month after her admission, the white count was 7,000 per c.mm. with a normal differential, and the spleen and glands were no longer palpable.

There is little doubt that this was a drug reaction, and at one time the blood picture was almost leukaemoid and a diagnosis of leukaemia was being considered when her condition started to improve with no treatment other than withdrawal of the phenylbutazone.

I wish to thank Dr. G. A. MacGregor for the clinical details and permission to publish this case.

—I am, etc.,

St. Luke's Hospital, Guildford, Surrey. A. LAWRENCE.

Dental Hygiene

SIR,—Mr. O. Gayer Morgan (November 26, p. 1603) suggests that the toothbrush is the most septic object in the bathroom. I would point out that cultures have been taken from such brushes which showed that few organisms survived after 24 hours, and that all these were harmless saprophytes from the mouth.[1]

The fact that Mr. Morgan finds the toothbrush a less efficient instrument for oral hygiene than the interdental stick emphasizes the difficulty in recommending any one technique for all mouths. When, as a result of long-standing gingival inflammation or advancing age, the interdental papillae become detached from the teeth, some form of interdental cleansing is essential to prevent gross bacterial growth in these stagnation areas. The regular and intelligent use of interdental sticks causes a controlled recession of the gingiva and reduction in the depth of any pathological pocket which may have developed. But to advocate the routine use of interdental sticks by children with previously healthy mouths might do immense harm by tearing the interdental gingiva from the teeth and producing potential stagnation areas. I would add that a severe form of gingival ulceration affecting children in Nigeria is thought to be caused by inexpert use of "chewing-sticks."

The toothbrush is undoubtedly still the best instrument for the artificial oral hygiene required by mouths on modern diets. The best technique and type of brush will depend on the condition of the gums; but for a healthy mouth the "roll" technique with a soft brush has been shown to be adequate for gingival health, without the risk of trauma.[2] A toothpaste helps the cleansing action and makes the procedure more pleasant, and now the American Dental Association has, at last, endorsed the claims of a fluoridated toothpaste as an "effective anticaries dentifrice."—I am, etc.,

Department of Preventive Dentistry, Guy's Hospital, London S.E.1. R. D. EMSLIE.

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SIR,—One wonders what prompts the generosity of Mr. O. Gayer Morgan in casting his pearl on oral hygiene, and what he hopes to contribute to the subject by his letter of November 26 (p. 1603). All his reading of correspondence and reports, and thinking over many years, have apparently led him only to a cocktail-party gambit: "The toothbrush is the most septic object in the bathroom." A friendly pathologist could have put him at ease and spared him much mental effort had his toothbrush and bath towel been sent for examination. As to bacteria being "injected" into the gum margin

by the toothbrush, I must accept the findings of Mr. Morgan's prolonged thinking, as in 25 years of dental practice I have not seen the condition.

"Toothpastes are useless and a waste of money." So perhaps is soap, but at least it is a pleasant social habit. We all know country folk who use soot or salt for tooth cleaning, and why not? Let Mr. Morgan use only his interdental sticks by all means—his best friend may eventually tell him. Unless, of course, in London W.1, he lives on the diet and adopts the way of life of primitive people, when he may easily get away with it.

When the occasional surgeon descends into the dusty arena of the oral cavity, it is usually to everyone's benefit. There are exceptions.—I am, etc.,

Caernarvon, North Wales. G. H. WILSON.

Psychiatric Seminars

SIR,—Dr. H. Stephen Pasmore (November 19, p. 1524) writes as follows: "At present this form of post-graduate education is only available in London at the Tavistock Clinic."

This statement is not quite correct, as almost from the time of its opening the Marlborough Day Hospital has been running different forms of courses for general practitioners, and from this long experience we have come to the conclusion that apart from monthly lectures the most fruitful form of course should include the following: (1) Mutual analysis of the members of the course. (2) The showing of actual cases, and analysing and discussing their psychopathology and their psychiatric diagnosis and prognosis and treatment. (3) Discussing cases which are being treated by the members of the course. (4) Discussing matters of psychopathology and psychotherapy. (5) Enabling the members of the course to work as unpaid clinical assistants at the hospital. (6) Appointments for the most able ones to serve two years as paid senior house officers for three sessions a week. (7) We encourage the members of the course to take an appointment in charge of a therapeutic social club, and to take part in group therapy sessions.

As a result of these courses one or two have become full-time psychiatrists, but the majority have remained in general practice, with a very much better understanding of their patients. To summarize, I can only say that I wish all general practitioners could have the chance of this form, or a similar form, of training.—I am, etc.,

Marlborough Day Hospital, London N.W.8. JOSHUA BIERER.

Faecal Incontinence in Children

SIR,—For the past month the differential aetiology of faecal incontinence in children has been allowed a most enjoyable airing in your columns. It would appear from all that has been written that the doctor is urged to understand these differences of aetiology so that he may direct his various cases down different expert channels.

Whilst I am fully in agreement with the clearest possible understanding of all the varieties of the cases, I contend, with all respect, that even then they are all most successfully treated by the general practitioner—the physiological ones by increasing fluid and food intake and the psychological ones by patience, willing sympathy, inactivity, and possibly a little phenobarbitone. Dr. J. J. Kempton (November 5, p. 1380) suggests a concert (atonal?) of paediatrician and psychiatrist, but Dr. Philip Pinkerton (November 12, p. 1451) talks very respectfully of the "field previously considered to be the exclusive province of the paediatrician." Faecal incontinence is a very personal affair and needs a very personal physician (general practitioner).

The physiological cases (which I think are the same as the congenital constipation of Dr. John Aply (November 12, p. 1451) arise from underfeeding (Dr. S. B. Dimson, November 5, p. 1380) or overclothing, both common conditions in infancy leading to dehydration. (Recognized at this stage these are obviously easy to treat.) Then unfortunately the resultant situation is aggravated by the addition of purgatives from the mother, with the subsequent misery of the passing of hard stools with or without fissures, and then the pot-refusal and the rearing of the psyche in defence. By now we have the second variety, the psychological ones. Admittedly these may occur as spontaneous psychological disturbances without the common physiological disturbances of earlier days; but in either case the situation calls for the same therapy, which the practitioner with patience and understanding can successfully perform without purgatives or enemas. A short holiday for the patient may be required in the long-standing cases; it really boils down to easing the family stresses, once the confidence is won.—I am, etc.,

Repton, Derby. D. W. S. SHELDON.

SIR,—It is curious that on November 12 four correspondence columns are devoted to two subjects which I venture to suggest are very much related (p. 1451, "Faecal Incontinence in Children"; and p. 1456, "School Phobia"). Dr. Seymour Spencer (p. 1456) states, "It is of no value to a child to be able indefinitely to flaunt the law, particularly in these present standardless times." Perhaps this advice is but an explanation of the success recorded by Dr. H. J. Pratap (p. 1452) in the management of his young teenager. What is distressing in the problems of these mixed-up children is that doctors can talk seriously (the last paragraph of Dr. Pinkerton's letter, p. 1451) of "psychiatric" treatment as something distinct and different from a "paediatric" approach, or does the latter term merely mean return to simple arithmetic? I venture to suggest that constipation is too complicated a subject to yield effectively to statistical analysis.—I am, etc.,

London S.E.19. D. F. ELLISON NASH.

SIR,—My answer to Dr. Barbara Evans's letter (November 26, p. 1605) is that the boy did not have to wash his pants, because he did not soil them any more. What is more, his asthma seldom troubles him now and there is a happy home atmosphere between the boy and his parents.—I am, etc.,

Liverpool 18. H. J. PRATAP.

White Mouse Medicine

SIR,—Dr. Hugh Sinclair (November 19, p. 1520) evidently believes that animal fats in the diet are responsible for the present epidemic of coronary thrombosis and that increased consumption of essential fatty acids is the remedy. He has convinced a number of people of this, and *Family Doctor* printed an account of his point of view by one of his converts, Dr. John Bradshaw, in May, 1960.

While admiring the vigour with which Dr. Sinclair has preached his gospel, I think it is unreasonable of him to object so strongly to Sir Heneage Ogilvie giving some of the counter-arguments in favour of animal fats, in the same journal, which is published by the B.M.A., to give the public a balanced view of difficult medical

questions such as this. Dr. Sinclair implies that Sir Heneage is wrong to incriminate lack of exercise, though there is evidence in favour of this view.

At the conference on the Health of Executives on November 24 Dr. Paul Dudley White concentrated more on lack of exercise than on dietary fat in his detailed prescription for avoiding coronary thrombosis in the middle-aged man, and based his long-term clinical approach to the coronary patient on a wide, multiple aetiology. He drew no clear distinction between helpful and harmful fats, and in this may have been heeding the recent warning issued by the U.S. Department of Health, Education, and Welfare[1]:

"It is the opinion of the Food and Drug Administration that any claim, direct or implied, in the labelling of fats or oils or other fatty substances offered to the general public that they will prevent, mitigate or cure diseases of the heart or arteries is false and misleading, and constitutes misbranding within the meaning of the Federal Food, Drug and Cosmetic Act."

This statement does not make encouraging reading for the food and pharmaceutical firms which Dr. Sinclair tells us are losing money by putting his theories into practice.—I am, etc.,

Kew Gardens, Surrey. RICHARD MACKARNESS.

REFERENCE

[1] Ogilvie, H., *Family Doctor*, 1960, **10**, 642.

SIR,—In the Panorama T.V. programme on Monday, November 29, Dr. Hugh Sinclair advocated a diet of brown bread, whisky, and cod. One must assume that he is serious about this, but it is difficult to believe it, for if he is successful in his advocacy the whole dairy-farming industry of the world will collapse and with it the arable farming must go.

The human misery which this would cause so far outweighs anything suffered by those with coronary atheroma that one wonders whether we are right to go on training scientists and spending money on research.

What is the aim of these people? As far as I can see at the moment, it is to eliminate cancer and heart disease. If they succeed, what then? Their answer is more and better contraceptives, in order that life may be denied to the unborn, so that the old can keep on getting older. This extraordinary clinging to life of any sort at all costs is a modern phenomenon. It is a sad one. The medical profession should back up the "unscientific" Sir Heneage Ogilvie every time and refuse to be blinded by "science."—I am, etc.,

London N.W.4. R. W. COCKSHUT.

Preventive Medicine

SIR,—A number of writers have recently expressed themselves in the medical and national press upon that misnomer preventive medicine. Most have been thought-provoking and constructive, even humorous, but the letter from Dr. Anthony Eustace (November 19, p. 1524) is too disparaging of his own profession to be any of these. Clichés and high-sounding phrases do little to hide the lack of reasoning in his criticism.

I believe his points are that prevention is better than cure and that much more time, effort, and money should be spent on it. In so far as the former is possible all will agree with the latter. But is prevention always possible, even of the conditions mentioned by Dr. Eustace? Is he not speaking of early diagnosis rather than prevention? Can either be carried out without the co-operation of the patient? Does the patient present himself as such until he feels unwell? To most people it is still a truism that "they that are whole need not a physician, but they that are sick."

This shows the muddled thinking behind the words, the doctor should use his surgery, "not, as at present, for the reception of the sick but as a place of check-up and advice." It is not the doctor that decides who shall come to the surgery but the patient. Even if, by "reorientating his thinking," the doctor could so change the existing order, where would the displaced "sick" go? It is only as a patient develops faith in his doctor during the mutually faced stresses of his life that he will listen to advice on so-called preventive medicine. That is why patients come from the welfare clinics to their own doctors with the words, "The clinic doctor said so-and-so, but I thought I'd come and ask you about it." Unhappily, one sometimes has to disagree with the clinic doctor.

Looking at our practice figures for last week I find that of 300 items of service no fewer than 65 could be termed social medicine in that they were inoculations, ante-natal or post-natal examinations, family planning sessions, discussions on problems of family, social welfare, business, housing, sex, school, infant feeding, diet, suitable games and hobbies, shoes, smoking, etc., and removal of socially embarrassing disfigurements. Few of these services could have been rendered without the request of the patients.

A doctor's primary function is to use every available means to cure or alleviate those who believe or know themselves to be diseased; only secondarily can he offer advice on the furtherance or maintenance of health. As with treatment, so with advice, it is up to the patient whether he takes it or not. While it remains the prerogative of the patient to initiate most doctor–patient relationships, so long will "preventive medicine" be done best within the confines of traditional, though not reactionary, medicine.—I am, etc.,

London E.18. CAREY D. BAKER.

Buffering and Suspending Agents

SIR,—There is a potential source of so-called penicillin reactions when buffering and suspending agents are used to make an injectable suspension of an insoluble penicillin. Should not the composition of these "agents" be disclosed on each product, and should there not be a standard list of accepted and not-accepted buffering and suspending agents?—I am, etc.,

London N.W.2. LEON RADCLYFFE.

POINTS FROM LETTERS

School Phobia

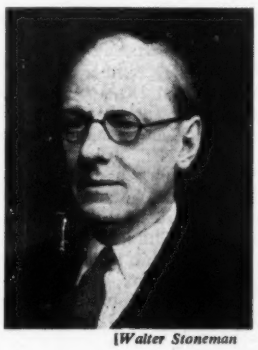
Dr. D. H. BAILEY (Burnhope, Durham) writes: Dr. R. T. D. Franklin's letter about this condition (October 22, p. 1238) throws some useful light on its origin, though he fails to mention the neurotic, psychopathic, or frankly bullying schoolteacher as a source of terror in a sensitive child. Most of us will recall such misfits in the teaching profession from our childhood, and possibly know a number as patients. Mr. A. W. Fowler's letter (November 12, p. 1456) has a much more sinister ring. While it is true that many of our present-day social sicknesses can be traced, in part, to a lack of discipline in the home, Mr. Fowler appears to fall into the all too convenient trap of confusing discipline with brutality, and his letter is a gem of rationalization. The absurd nonsense in the quoted text must have cleared the consciences of countless aspirants to Murdstonism, and is probably one reason for the sad fact that many of the most bestial flagellants in the sordid history of this perversion have been ecclesiastics and religious pedants, some of them conveniently placed as masters in public schools.

Obituary

Sir HAROLD BOLDERO, D.M., F.R.C.P.

Sir Harold Boldero, Registrar of the Royal College of Physicians and former Dean of the Middlesex Hospital Medical School, died suddenly at his home in London on November 30 at the age of 71. In the history of the medical profession during the last 30 years he has many claims to fame, and he earned the gratitude and affection of a wide circle of colleagues, students, and associates.

Harold Esmond Arnison Boldero was born on August 22, 1889, the son of John Boldero, J.P., of Mark Cross, Sussex, and was educated at Charterhouse and Trinity College, Oxford, before entering the Middlesex Hospital Medical School. He was an outstanding athlete, representing Oxford in the 440 yards in 1911, and then as a hockey player, at Oxford and later with the hospital team, he gained a reputation and international representation as a fast and clever centre-half. He also played lawn tennis for the hospital. He qualified with the Conjoint diploma in 1915 and then served in France as a regimental medical officer in a field ambulance and as a D.A.D.M.S., returning to Middlesex as a major in 1919. He was twice mentioned in dispatches.



[Walter Stoneman

Boldero soon made his mark even in junior appointments, for he was an outstanding teacher with a great sympathy for and understanding of the young, a characteristic which he did not lose throughout his life. He was one of the first batch of medical registrars appointed to the Middlesex with teaching duties, and his particular interest was in paediatrics. After a period as clinical assistant at Great Ormond Street in 1921 he was appointed to the staff of the Evelina Hospital for Children, and in 1922 he was elected an assistant physician to the Middlesex Hospital. It was the custom in those days for the children to be looked after by the junior physician, and this was much to Boldero's liking. He formed an association with a senior colleague, E. A. Cockayne, also particularly interested in children, and until 1934 his medical activities were mainly concentrated on paediatrics. He had a flair for dealing with children and appeared to be able to enter into their way of thinking. The older generation of his colleagues and their wives remember him with gratitude for the help he gave them in this particular role.

In 1934 Boldero succeeded Izod Bennett as dean and began a new and fruitful career as medical administrator. It is on this aspect of his work during the last 26 years that his reputation in the medical profession generally has been founded, but there are many of his colleagues who regret that national circumstances and the call of duty interrupted a career of such promise in the clinical and teaching field. The 20 years of his outstanding work as dean covered a period of great difficulty in the life and development of the school, for they included the preparations for war, the war period, and the post-war reconstruction. In his first years he was concerned with the better integration of clinical medicine, teaching, and research, and was responsible, with Webb-Johnson, for the concept of the Courtauld research wards, to which patients were admitted for investigation under the joint care of a member of the staff of the hospital and a professor of one of the basic sciences in the school. As soon as the hospital building was completed he drew up plans for the rebuilding of the medical school, but unfortunately only the first phase, an administrative block, could be completed before the outbreak of war in 1939 put an end to all such developments. In 1938, at the time of the Munich crisis, Boldero was called on to make plans for the continuation of the work of the school and hospital in case of war, and was actively engaged in these preparations until, in 1939, in common with the other undergraduate deans, he was appointed as group or sector officer in the Emergency Medical Service.

From that time onwards he rapidly grew in stature, and his opinion was always among the first to be sought by his fellow deans and by the various responsible ministries. He kept the school together without interruption of teaching through two evacuations to Bristol and to Leeds, and, when the hospital was damaged, with great energy and foresight he managed to get repairs and rebuilding carried out at the earliest possible time so that the returning staff came back to an intact institution. His contribution to the school in the post-war decade was equally outstanding. It was an era of beginnings of new thought on the organization of medical education, of new relationships between school and teaching hospital. As doyen of the deans, as a member of the Senate of the University of London and chairman for many years of its Board of Advanced Medical Studies, Boldero was able to draw on his great experience and gave strong leadership and sage advice. He was a Middlesex man first and foremost, and the school and hospital owe him a deep debt of gratitude.

Boldero had other firm allegiances. The University of Oxford, where he graduated B.M., B.Ch. in 1920 after his return from the war, proceeding to the D.M. in 1925, was particularly close in his affections, and he retained great pride in his membership of Vincent's. It is, however, with the Royal College of Physicians in addition to Middlesex that his name will always be linked. He obtained his Membership in 1922 and was elected a Fellow in 1933. His ability as an administrator was recognized by the College in the early days of the second world war, and, after serving as Treasurer, he was appointed Registrar in 1942. He served in this office for 18 years, during the terms of the presidencies of Lord Moran and Sir Russell Brain and continuing with the present president, Sir Robert Platt. He had an extensive and detailed knowledge of College affairs, keeping in the forefront of his mind, and devoting his energies to, the part which the College should play in the development of national policy with regard to medicine. His knowledge of the organization and practice of medicine and of medical education which he had obtained as a dean and from his university appointments he was now able to use on a wide national stage. Together with the presidents whom he served he had a great influence in the many negotiations which led to the acceptance of the National Health Service by the medical profession and of the acceptance by the Government of the necessity for modifications in the Service. Throughout the 18 years he continued to play a prominent part, not as the chief negotiator, but as a strong and wise counsellor whose opinion was always sought and who frequently remained in the background.

Few people realize how great an influence Boldero had in some of the fundamental concepts of the Health Service, of the definition of consultant, of the organization of the registrar hierarchy, and of the present pattern of pre-registration house appointments. He kept rigidly to his conception of the part which the College should play, and refused to deviate even under extreme pressure if he considered the issues to be important, and his influence in discussion was frequently decisive owing to his experience as a committee man and ability to take a long-sighted view.

Boldero served on many official committees and organizations, including the General Medical Council and, since its inception, the North-West Metropolitan Regional Hospital Board, and for six years he was chairman of the council of the Chartered Society of Physiotherapy. He was

knighted in 1950. Adamant in his adherence to orthodox procedure, he could appear at times when on official business to be rather austere and distant in manner, but these characteristics would be relieved when the occasion demanded it by an appropriate light remark and by his brilliant, rapier-like humour. On social occasions he was excellent company with a very ready wit.

Fate dealt Boldero many hard blows. His wife Margery died in 1950 after a prolonged illness, and he himself was stricken with a sudden and severe illness in 1946. With the same characteristic courage which he had shown after his eldest son was killed in a shooting accident during the war, he returned with undiminished energy to the school and College to which he was dedicated. He was one of those rare individuals to whom his colleagues continually came for advice not only on official but on private and personal matters, and it was given always with kindness, sympathy, and understanding. He will be greatly missed by many colleagues and former students, on whom his friendship has been a lasting influence.—B. W. W.

R. P. writes: I never knew Hal Boldero well until 1957 and will try only to say something of the man as I found him. Devotion, integrity, wisdom, and judgment were his most obvious assets. In debate he could use formality when it was required, but was never bound by it. The technique we will best remember was the comment thrown in rather late in the discussion with a dry wit which was more in understatement and in the manner of delivery than in the words themselves—a comment often revealing the right decision for which we had been striving. All these gifts were loyally used in the service of the Royal College of Physicians for many years and during three presidencies.

More intimately, he was reserved, and had known sadness. Not enough people knew him well. Lonely he probably was, but uncomplaining. Kind, generous, and sensitive, he had a touch of schoolboy fun revealed perhaps only to those who knew him best. Courage he had shown in war but also in his personal affairs. Though his life was precarious in latter years he never alluded to his health and was touched and grateful for the occasional solicitous inquiry. Only twice can I remember a hint from him to indicate that he might never see the new College for which he was working so hard. I had dreaded that this winter would bring a return of his 1959 illness even more prolonged. His sudden death, though it shocked us all, released him from that danger. Perhaps he should have left London. But to leave London would mean leaving the College, and he made his choice.

T. H. S. writes: Few people in the medical profession fully realize what they owe to Hal Boldero. Though he was well known in his titular offices of Registrar at the Royal College of Physicians and as a former dean of Middlesex, he performed many other valuable services in which his great skill and experience in administration and organization were allowed full scope. From the beginning of the Health Service he was one of the secretaries to the Joint Consultants Committee and played a major part in all negotiations and notably in drawing up evidence to put before the Royal Commission. He was also a member of a regional hospital board and many other bodies.

All those who knew him in committee depended not only on his great experience but on the knowledge that this urbane and precise statesman would always put reason and principle before expediency or political consideration. His ability to see all aspects and implications of a problem enhanced the value of his opinions, which were clearly but unassumingly stated, and his associates will long remember his gentle requests "to think aloud for a few moments" or "to say a few words to clarify his own thoughts." These utterances were invariably the summary and conclusion of a long period of discussion and debate.

His courteous and precise manner was accompanied by a quickness of thought that gained much from an incisive wit. His repartee could be devastating, but it was polished and never cruel. He was a perfect host or guest, and time spent in his company was time spent with a highly entertaining and cultured man.

It would be a mistake to regard Hal Boldero only as a superb administrator or committee man; that was our experience of his latter days. His athletic prowess is still recalled in many circles, and when he withdrew from clinical work his colleagues viewed the decision with real regret, for they were losing not only an excellent physician but a first-class teacher. As dean, his continuing contact with the student world made him fully appreciative of the problems of the young, and it was as a man young in spirit that he was actively working on the day of his death.

R. R. SIMPSON, M.B., Ch.B., F.R.C.S., F.R.C.S.Ed.

Mr. R. R. Simpson, consulting ear, nose, and throat surgeon to the Hull Royal Infirmary and president-elect of the British Association of Otolaryngologists, died on November 26, aged 58.

Robert Ritchie Simpson was born on December 18, 1901, and graduated M.B., Ch.B. at Glasgow in 1923. Almost at once he became attracted to the specialty that occupied his working life and which he adorned. He was clinical tutor and senior clinical assistant in the E.N.T. department at Edinburgh before coming to Hull as senior house-surgeon, working under Ritchie Rodger. In 1927 he obtained the F.R.C.S. of Edinburgh and was appointed to the consulting staff at Hull Royal Infirmary and the Children's Hospital, becoming senior consultant when Dr. Ritchie Rodger retired in 1938. His work was always expanding and he was available for consultation in the municipal hospitals, as they were then, and with the willing co-operation of the medical officer of health built up a first-class service for his specialty in the school medical department.

In spite of his busy life he was a regular attender at the Royal Society of Medicine, where he often spoke, and in 1954 he was president of the Section of Otology. In that year he was elected F.R.C.S., England, *ad eundem*. Prior to the outbreak of the second world war he joined the Special Reserve, and served as E.N.T. specialist from 1939 to 1945. He spent most of these years abroad, particularly in Ceylon.

He was a member of the Council of the British Association of Otolaryngologists, and had he lived he would have been installed its president in December. He was president of the East Yorkshire Branch of the British Medical Association from 1950–2, and of the Hull Medical Society, and at the Annual Meeting of the B.M.A. in Cardiff in 1953 he was vice-president of the Section of Otorhinolaryngology. He served for many years as a member of the Hull "A" management committee and was chairman of the panel of his specialty under the Leeds Regional Hospital Board.

Outside his profession he took a great interest in the life of Hull. He was a keen Rotarian and president of the Literary and Philosophical Society and a justice of the peace for some years. When he was recovering from his first major illness nearly ten years ago he occupied his enforced idleness by studying Shakespeare from a medical angle. This study fascinated him and culminated in the publication last year of his book *Shakespeare and Medicine*, which was well received all over the world. His chief recreation was fishing, and it is pleasant to think that this autumn he had a very happy fishing holiday in Scotland. He was loyal to his juniors, and it was a privilege to be admitted to his friendship. He leaves a devoted wife and three children.—D. C. M.

Dr. A. HUTCHISON, medical officer of health of Hull, writes: Mr. Robert Simpson was, along with his great colleague and friend, Mr. Ritchie Rodger, responsible for the foundation and organization of the ear, nose, and throat service for schoolchildren in Hull. In 1927 he and Mr. Ritchie Rodger were appointed by the Hull Corporation on a sessional basis to undertake work on behalf of the school health service. This joint service continued until the out-

break of war, when Mr. Simpson went away on war service and Mr. Ritchie Rodger carried on alone. In 1945, when he returned, Mr. Simpson again took up where he had left off and in addition commenced visiting the Sutton School for the Deaf, which he continued to visit frequently until his death. In 1947, when Mr. Ritchie Rodger resigned, Mr. Simpson carried on alone until 1954, when two other consultants were appointed on a sessional basis to assist him. He was responsible for many improvements in the service and he was always receptive to new ideas. But first and foremost he loved children, and it was because of this that the service at which he had worked so hard was such a successful one. He will be sadly missed.

JAMES PHILLIPS, F.R.C.S.Ed.

Mr. James Phillips, formerly senior honorary surgeon to the Bradford Royal Infirmary, died in Bradford on November 19, aged 86 years.

James Phillips was born in Govan on March 25, 1874. He studied medicine at Bristol, where he distinguished himself as gold medallist in medicine and surgery. After qualifying M.R.C.S., L.R.C.P. in 1898, he took the F.R.C.S. of Edinburgh in 1901. After a house appointment at Leicester Infirmary he came to the Bradford Royal Infirmary as senior house-surgeon, and remained in Bradford for the rest of his life—a life full of achievement and distinction. Appointed assistant surgeon to the B.R.I. in 1902, he worked as a partner in a general practice (an economic necessity in those days, when he was allowed two beds at the infirmary) till he was appointed consulting surgeon in 1911.

[Telegraph and Argus, Bradford

H. F. writes: A dexterous operator with nimble fingers and a keen mind, James Phillips was always ready to learn and always learning new techniques, and his reputation increased with the years. His surgical interests were wide, and he had a particular leaning to gynaecology. He held many offices and appointments, including those of chairman of the Bradford Division of the British Medical Association in 1924, and vice-president of the Section of Obstetrics and Gynaecology at the annual meeting of the Association in Bradford in that year. He was president of the Yorkshire Branch of the Association in 1932, and had been a founder member of the Moynihan Surgical Club and the Association of Surgeons of Great Britain and Ireland. Besides being honorary surgeon at the Bradford Royal Infirmary he held similar appointments at St. Luke's Hospital, the Children's Hospital, Salt's Hospital, Bingley Hospital, and the Spenborough Cripples' Clinic. He laboured tirelessly at St. Luke's when it was a military hospital in the first world war, during which he served as a major in the R.A.M.C.

As a member of the committee of the B.R.I. from 1911 till the inception of the National Health Service in 1948, when he became one of the first members of Bradford "A" Group hospital management committee and chairman of No. 1 house committee, he gave devoted and valuable service to the hospital administration. He was an active member of the small committee which planned the new Royal Infirmary—opened in 1936 alongside the Duke of York Home and the Radium Institute, which he also had helped to plan. After his retirement from active practice he devoted his great gifts to serving the public as a magistrate for 20 years, until his retirement under the age limit, and as chairman of the Bradford juvenile court.

He bestrode the remarkable span of 60 memorable years in Bradford like a colossus, making his mark in everything he did. He had the affection, admiration, and respect of all his colleagues, and the tremendous congregation which filled the Salem Congregational Chapel for his funeral service—with representatives from every walk of life, including the Lord Mayor, magistrates, doctors, hospital matrons and sisters, nurses, administrators, and the general public—was the greatest and most sincere tribute he could have wished and had assuredly earned.

He married Sister Rose Smith in 1919. To this dear and charming lady, who was such a great source of comfort and strength to him for the rest of his life, and to his devoted only daughter, goes our deep sympathy.

F. R. R. M. writes: To anyone, privileged as I have been, to have known Jimmie Phillips for nearly 40 years, and to have grown to value the friendship between his family and my family more and more with the passage of time, the difficulty of writing an adequate appreciation of his lifelong service to the citizens of Bradford, not only as a doctor and surgeon, but also as a magistrate, an active Rotarian, and a man of wide interests in the cultural life of the city and in the well-being of its less fortunate citizens, is at once apparent.

Of his activities as a doctor and a surgeon, others who worked with him in the years during the first world war, and in the two decades which followed it, may be more qualified to write at length than I am. He was an intimate friend of Lord Moyniham, and the enthusiasm and success of his career as a surgeon undoubtedly stemmed from the mental stimulus anyone received when they came into contact with that great man. He was always willing to apply new methods of treatment, and as early as 1935 he was using intravenous saline therapy. He took an active part in the British Empire Cancer Campaign. He was a founder member of the Provincial Surgical Travelling Club, and Bradford profited by the experience which Jimmie claimed from his numerous visits to other centres as the years went by. When the time came for him to retire from active surgical work he continued to give the "A" Group of hospitals in Bradford many hours of his time each week. He was always ready to help and advise more recent arrivals on the staff of the hospital, such as myself, as occasion demanded, and such advice was never found to be out of place.

His interest in the social welfare of less fortunate members of the community is shown in the numerous activities he undertook of a humanitarian and philanthropic nature. For more than 30 years the Guild of Help, and subsequently the Council of Social Service, the juvenile bench (of which he was chairman), Rotary, in its fullest and widest sense (he was district chairman in 1933), and very many other local organizations for the alleviation of suffering and poverty in the city, benefited from his ever active and inspiring leadership.

In his home, Jimmie was the perfect host; always he had a sincere welcome for his guests, and his hospitality was unstinted. Children always found him easy to approach, and the small things which make all the difference to their lives he knew how to supply better than anyone else I have known: jokes, mirror-writing, interesting stories, and a fund of humour and wit were never failing. Yet with all this he was a man of extreme erudition: his reading showed a wide variety of interests, and he could entertain the Bradford Athenaeum Club to paper after paper as his turn came round on a great variety of subjects. His Christmas cards had a certain individuality about them not often encountered elsewhere, since they always had a quotation in them chosen by him and his wife.

In all these multitudinous activities, his unassuming manner, his modesty, his self-discipline, his honesty, his generosity, his fortitude in illness, and his untiring energy will be a lasting example for those who knew him. Bradford mourns a great citizen, and thanks God for a life so nobly spent in the service of others.

CHARLES LAUBRY, M.D.

Professor Charles Laubry died in August at the age of 87. A cardiologist of international renown, he was professor of clinical cardiology in the Faculty of Medicine of the University of Paris and the first president of the International Society of Cardiology.

Charles Laubry was born at St. Florentin, in the Department of the Yonne, on November 11, 1872. He graduated in medicine in 1903, and as a pupil of Vaquez was trained in the great tradition of the Paris school of cardiology. Vaquez had founded the *Archives des Maladies du Cœur* with the assistance of Laubry and Aubertin in 1908, and after his death in 1936 Laubry assumed directorship of the journal, and with the help of its editorial committee established the Société Française de Cardiologie. This was the reverse of what had happened in Britain, for it was the British Cardiac Society that started the *British Heart Journal*.

Laubry's clinic was at the Hôpital Broussais in a poor part of Paris. As a clinical teacher he was superb, in manner paternal and good-humoured, and in discourse polished yet lively and a master of clarity. In an obituary tribute Professor Léon Binet, dean of the Faculty of Medicine in Paris, said that a characteristic of Professor Laubry's teaching was that he regarded the heart not as an isolated organ, "mais comme le centre convergent, le plus sensible, le plus frémissant de la personne humaine." Among the notable contributions he made to his specialty was his work on the radiology of the heart, incorporated in a massive study published in 1939 and entitled *Radiologie Clinique du Cœur et des Gros Vaisseaux*. When he gave the St. Cyres lecture at the Royal Society of Medicine in London in 1937 he chose as his subject gallop rhythm, on which, with Pezzi, he was the author of a monograph. He also wrote on the treatment of congenital cardiac disorders, and was the author of a large textbook on heart disease, though probably his most characteristic work was *Leçons de Semiologie Cardiovasculaire*, published in 1924. The chair of clinical cardiology at Paris was created for him so that he could continue teaching when nearing the age of retirement from his hospital appointments. In 1939 he was elected an Honorary Fellow of the Royal Society of Medicine.

Professor Laubry was a member of that select band who have read their own obituary notices. During the German occupation of France news of his death was reported from Switzerland, and an obituary was published in 1941 in the *British Heart Journal*. It was typical of Professor Laubry that he was later delighted to find how warmly he was regarded by his friends in Britain.

He had long been interested in forming an international society of cardiology, but it was not until 1950 that the first International Congress of Cardiology was held in Paris under Laubry's presidency. Two years later the European Congress of Cardiology held its first congress in London, and at its opening session the chairman, Sir John Parkinson, introduced Professor Laubry as "the illustrious master of European cardiology." Honoured abroad and in his native land—an Academician of France, he was a member of the Institut de France, a Grand Officer of the Legion of Honour, and a past-president of the National Academy of Medicine—Professor Laubry was one of the greatest clinical teachers of his day in France, inspiring and encouraging others to emulate his own whole-hearted devotion to cardiology.

D. E. B. writes: Charles Laubry occupied a unique position of prestige and authority in cardiology. He was a man whose personality impressed itself on all who came in contact with him, and who possessed powers which swayed the hearts as well as the minds of his fellow men. As a physician, he was an admirable exponent of the Hippocratic art, and his humanity, sympathy, and understanding endeared him to all his patients. As a teacher, his clinical wisdom was enlivened with a spirit of gaiety and vivacity, so that there was never a dull moment in his ward rounds.

Perhaps the most remarkable feature of Laubry's career was that he accomplished so much in the evening of his life, and after he had retired from hospital duties. Aged 63 when he inherited the mantle of leadership in French cardiology from Vaquez, the war soon curtailed his activities, but after the war, though aged over 70, he took up the reins of leadership with undiminished vigour. He attended the Cardiological Congress in Mexico in 1946, the International Conference of Physicians in London in 1947, and took part in founding the European Society of Cardiology in Brussels in 1948. In 1950 he organized the first World Congress of Cardiology in Paris, where he was elected first president of the International Society of Cardiology. Aged over 80, he attended the second World Congress of Cardiology in Washington, where Sir John Parkinson delivered the Laubry Lecture in his honour, appropriately entitled "Leadership in Cardiology." In 1950 he published an original translation of Harvey from the Latin, with a historical introduction to the discovery of the circulation, and also a second edition of his book on coronary disease which he wrote with Soulié.

When I called to see him at the Avenue Victor Hugo a few months before his death he was in good form and still retained much of his old vivacity, but he felt that his task was finished. After half a century of teaching he had lived to see his pupils all over the world win their spurs, and what more could he want? Cardiology has lost a good and faithful servant who will be remembered with affection and admiration by all who knew him.

J. M. HAMILL, O.B.E., M.D., D.Sc.

Dr. J. M. Hamill, who was formerly a Senior Medical Officer of the Ministry of Health and in charge of the Ministry's Food Division, died suddenly on November 29 at his home in London. He was 80 years of age.

John Molyneux Hamill, son of Philip Hamill and Annie Molyneux, was born on July 30, 1880. He was educated at St. Paul's School and Trinity College, Cambridge, of which he was a scholar. His academic career was a brilliant one, for he obtained a first class in Parts I and II of the Natural Sciences Tripos, and he also took the B.Sc. of London University in 1902, being first in the first-class honours list in physiology and winning a university scholarship. In 1901 he entered St. Bartholomew's Hospital with a senior entrance scholarship. He qualified M.R.C.S., L.R.C.P. in 1904, and graduated M.B., B.Ch. at Cambridge in the following year. He was already known for his research work in physiology, recorded in papers in the *Journal of Physiology*, and had been appointed Sharpey physiological scholar at University College, London, in 1904. In 1906 he took the D.P.H. of the Conjoint Board, in 1907 the D.Sc. of London, and in 1908 he proceeded to the M.D. at Cambridge.

At the beginning of the present century much attention was paid by the medical department of the Local Government Board to outbreaks of food-poisoning, and measures were taken to improve the quality and purity of food supplies. To this end in 1905 a special Foods Branch was established on the initiative of Sir William Power, F.R.S., Medical Officer of the Board, with Dr. G. S. Buchanan (afterwards Sir George Buchanan, the younger) as Chief Medical Inspector of Foods. In planning the staff of the branch an expert chemical physiologist and a research chemist were sought, and John Hamill and G. W. Monier-Williams were selected in these capacities. No better appointments could have been made. In 1911 Dr. Buchanan became Chief Assistant Medical Officer of the Local Government Board and Dr. A. W. J. MacFadden was appointed Chief Inspector of Foods, and ably continued the medical administration of the Foods Branch with the help of Hamill and others. Hamill's work from 1908 to 1913 is represented by various reports made to the Local Government Board.

When war came in 1914, Hamill was mobilized as a major in the R.A.M.C. (T.F.). He served as D.A.D.M.S. (San.) in France at the General Headquarters of the British Expeditionary Force; and was also for a time sanitary officer to the Central Force Headquarters, Horse Guards. For his war services he was appointed O.B.E.

On the formation of the Ministry of Health in 1919 Hamill became deputy senior medical officer to the special section of the Medical Department concerned with the supervision of food supplies (including nutrition), with Dr. MacFadden as his senior medical officer. This special section with Hamill as liaison officer worked in close co-ordination with the Medical Reseach Council.

In 1921 the Ministry published a report by Hamill entitled "Diet in Relation to Normal Nutrition," which reviewed existing knowledge at that time about diet and furnished guidance on the principles which should govern the proper selection of food in respect of both economical expenditure and nutritional value. This was of service in disseminating and applying scientific knowledge among the people. In 1924 he wrote a report entitled "Notes on the Pasteurization of Milk," which paved the way for legislation on the subject. Dr. Hamill by his advice and experience also greatly assisted the deliberations of the Ministry's Advisory Committees on Nutrition. He served on various departmental and interdepartmental committees, and was British Government delegate to the World's Dairy Congress (Washington, U.S.A., 1923; London, 1928; Copenhagen, 1931; and Rome, 1934). He was chairman of a Commission to inquire into Milk Production in Holland and Denmark in 1927. In 1934 he succeeded Dr. MacFadden as senior medical officer of the Foods section. Hamill was an authority on "food standards" and on tinned foods. His work in the Central Health Department, based on sound scientific principles, was of permanent value in improving the national dietary and in maintaining the quality and purity of food supplies.

John Hamill was tall and broad in proportion. He was a most pleasant colleague and was deservedly popular both inside and outside the Ministry of Health. Courteous and accessible, at the same time when occasion demanded he would express his views forcibly and incisively. After the first world war he was subject to attacks of phlebitis of the legs, which incapacitated him from time to time; and in 1940, having reached the age limit, he resigned from the Ministry's service.

Hamill married in 1932 Lesley, daughter of the late R. B. N. Findlater. His last years were clouded with sorrow, for his devoted wife died in 1957 and his brother, Philip Hamill, M.D., F.R.C.P., to whom he was much attached, in 1959; and he himself was in indifferent health.—A. S. MacN.

JAMES C. SEYMOUR, M.B., B.S.

The tragic death of Dr. James Seymour, after a road accident near Nottingham on November 28, will have brought sorrow to his family, many friends, and colleagues. Aged 39, he was Bernhard Baron research scholar at the Middlesex Hospital, and his loss to the field of research into diseases of the ear will be most keenly felt by those interested in these problems.

James Croley Seymour was born on August 19, 1921, in India, where his father was practising as an engineer. His early schooling was in South Africa after his family went to live there. He came to England shortly before the second world war, and received his medical education at St. Bartholomew's Hospital, graduating M.B., B.S. in 1945. As a student he was recognized as an individualist endowed with a very high intelligence and a keenly critical mind. For a man gifted with a remarkably capable and gentle pair of hands it was natural that his interest should turn to surgery. It was this gift that helped him with his remarkable subsequent researches into the physiology of the inner ear. After qualification he was first appointed house-surgeon at St. Bartholomew's Hospital and then house-surgeon to the Bart's neurosurgical unit at Hill End Hospital, St. Albans, where began his lasting interest in neurosurgery. After service with the Royal Air Force he became assistant to the late E. R. Garnet Passe, and from him he developed his interest in Ménière's syndrome and in the physiology of the inner ear. He was appointed Bernhard Baron research scholar at the Middlesex Hospital in 1949, a position that he held until his death.

James Seymour would never publish until he was absolutely sure of his findings. This integrity coupled with his magnificent and highly original work brought him respect from other workers all over the world. His contributions to the knowledge of the vascular circulation in the labyrinth and of its pathology will be a lasting memorial. It is tragic that after 11 years of research, when he was about to publish much of his findings, he should have been killed. He was to have given an Arris and Gale demonstration at the Royal College of Surgeons in 1961, and early next year to have read an important paper on Ménière's syndrome at the Royal Society of Medicine, which awarded him the Norman Gamble prize in 1955.

Some of Seymour's happiest days were spent as annual locum assistant at the Bart's neurosurgical unit. In spite of working most of the year in research, he undertook this duty with the skill that would have done credit to a full-time neurosurgeon. His kindness to patients, to all in trouble, and friendliness to people from all walks of life will keep his memory fresh and will be an inspiration to all those who knew him.

He never married, and was essentially a lonely man. He was always modest about his achievements. A search for a spiritual life led him to the Catholic Church. He was a competent artist and derived much pleasure in recent years from fishing. We extend our deep sympathy to his family.

J. P. M. writes: The untimely death of J. C. Seymour at the early age of 39 is indeed a tragedy. It is a personal sorrow to us at the Middlesex Hospital Medical School, but a still greater loss to the whole field of otological research, where his reputation was already international. Seymour, by his early training in neurosurgery and his intense interest in neurophysiology, was ideally suited to the study of the mechanism of the inner ear. His great mental ability combined with exceptional manual dexterity enabled him to conceive and carry out many very difficult investigations, and he had already contributed much to our knowledge. His views were not always accepted, but they were not put forward lightly, and had he been spared I feel sure that they would have been substantiated and that he would have gone on to still greater heights. Seymour, though firm in his defence of his beliefs, was a kind but rather retiring person and none of us knew him intimately. I am told that he used to sail small boats and play very good tennis, and he excelled at swimming. We offer our sincere sympathy to his parents in South Africa, and regret the loss of one who, already having done much, would undoubtedly have done still more for our specialty.

C. M. PEARCE, M.B., B.S., F.R.C.S.

Mr. C. M. Pearce, consulting surgeon to Blackburn Royal Infirmary, died in that hospital on August 6. He was 61 years of age.

Cyril Morgan Pearce was born at Tongwynlais, Glamorgan, on January 19, 1899, the son of a civil engineer. Following a family tradition, he was educated at Charterhouse. During the first world war he served as a combatant in France in the 119th Siege Battery of the Royal Garrison Artillery and was wounded. On demobilization he became a medical student at St. Bartholomew's Hospital, qualifying in 1923, graduating M.B., B.S. in 1924, and taking the F.R.C.S. in 1925.

After qualification he held a number of posts at St. Bartholomew's Hospital, including those of house-surgeon, house-surgeon to the orthopaedic department, senior resident

anaesthetist, and chief assistant to the surgical unit. Thereafter he went to Blackburn and became consulting surgeon to the Blackburn Royal Infirmary and several other hospitals in the district. In addition to his surgical work he was in general practice, in partnership with the late Dr. Jeffrey Ramsay, F.R.C.P., and became Treasury medical officer and medical officer to the Ministry of Pensions and Board of Education. Besides holding office as honorary secretary of the Blackburn Division of the British Medical Association from 1928 to 1932 and as chairman in 1950–1, he was president of the Blackburn and District Medical Society in 1958.

Mr. Pearce leaves a widow and a daughter who is married and resides in Capetown.

F. C. S. writes: I was Mr. Pearce's anaesthetist for 25 years. He was of a dying race, the combination of consultant surgeon and general practitioner. With him speed was the essence of the contract, and he will long be remembered at the Blackburn Royal Infirmary not only because of his operating speed but because of his appropriately humorous remarks during operations.

He was the anaesthetist's friend, for he knew how far to go in an operation so that the patient was off the table before he had time to be badly shocked. A considerate man, he was interested in anaesthetics and advised and encouraged me to advance from the "rag and bottle" to modern anaesthetic practice.

Mr. Pearce, in addition to being a very able surgeon, was a true family doctor. He was a kindly man who was liked and respected by his patients and colleagues alike. He had a keen sense of humour and was in great demand as a witty after-dinner speaker; in addition, he was well read and kept abreast of all the latest developments in surgery. In every possible way he helped me, and it was a privilege to have been his anaesthetist for 25 years and to have looked after his practice during holiday periods. During that time we became friends as well as colleagues. Outside his work he had a quiet social life. His hobbies were photography, motoring, and reading.

His illness lasted only six weeks, and when he knew he could not get better he adopted his typical attitude of having as little fuss as possible.

Medical Notes in Parliament

PAYING OUT ON PILKINGTON

[FROM OUR PARLIAMENTARY CORRESPONDENT]

The MINISTER OF HEALTH made some comments on the payment of arrears under the Pilkington award, when on December 5 the House of Commons considered briefly a Supplementary Estimate of £37,665,600 for the National Health Service, most of it for payments to doctors as a consequence of the recommendations of the Royal Commission.

Dr. EDITH SUMMERSKILL (Warrington, Lab.) had asked him, Mr. POWELL said, about the arrears due to doctors in the hospital service. So far as they related to the arrears back to January 1, he would expect them to be paid before the end of this calendar year. He hoped that the payment of arrears back to 1957 would be paid by the end of this financial year [March 31, 1961]. Fairness was of the essence in the distribution. It was a very complicated calculation that regional hospital boards had to make. For the sake of a few weeks, however overdue these payments were, no one would wish to lay themselves open to the charge that the distribution was not as right and fair as it could be made.

The Million Pounds

As for the sum of £1m. which Dr. SUMMERSKILL and Mr. L. PAVITT (Willesden, West, Lab.) had mentioned, it arose out of a Pilkington recommendation that the remuneration of general practitioners should be distributed in a manner to be agreed on between the Health Departments and the profession. The joint working party set up to implement the recommendation, by agreement, recommended that the sum of £1m. a year should be reserved "so that further consideration could be given to methods of making the best possible general medical service available to the public." They also recommended that a further working party of representatives of the profession and the Health Departments should be appointed to consider this. That had been welcomed by the General Medical Services Committee and had been accepted by the profession at the end of September. It would be an impertinence or worse on his part to indicate in advance of the conclusions of the working party how he believed that £1m. should be applied. In all probability it would not be paid in the course of the current financial year. A number of M.P.s had made the point that the House should have detailed information of the result of this consideration, and he would consider how in due course that could be made available.

Dr. SUMMERSKILL had asked him, he concluded, whether he believed that the increase would result in a sufficient increase in recruitment to the profession. He would not like to hazard a specific prediction, but he thought there could be no doubt that the great improvement in the pay and prospects of the profession which would result must have a beneficial effect on both quality and numbers. He hoped the new opportunities which acceptance of the award gave to all who were concerned in the Health Service would not be lost.

The Estimate, and the corresponding Scottish Estimate, were agreed to.

MARSHALLING OPINION ON FREE DRUGS

[FROM OUR PARLIAMENTARY CORRESPONDENT]

The demonstration in support of free drugs for private patients goes steadily on, attracting more adherents and opponents. Both motion and amendment now carry more than 100 signatures. Drawing attention to this fact during the weekly exchanges about future business on December 1, Mr. M. LIPTON (Brixton, Lab.) invited Mr. R. A. BUTLER, as Leader of the House, to find time before Christmas for "a friendly discussion on this important matter," in which, he added, they would all like to hear what the Minister of Health had to say. But it will not happen. Mr. Butler's words, "I cannot undertake that there will be time before Christmas," means simply, "No." The terms of the Conservative back-benchers' motion have been given here before.* It asks the House to declare its opinion:

"That private patients should be enabled to obtain their medicines and drugs on the same terms and conditions as National Health Service patients; and urges the Government to introduce the necessary legislation without delay."

The opposing view, as expressed in the Labour amendment, is that

"The Government should resist all pressures to enable private patients to receive medicines and drugs free of charge, as this would place an increased burden on the taxpayer, would encourage a first- and second-class service in general practice, and adversely affect the incomes of general practitioners wholly or mainly within the National Health Service and would be contrary to the principles on which the Service is based."

QUESTIONS IN THE COMMONS

Regional Consultants' Association

Mr. L. PAVITT (Willesden, West, Lab.) asked the Minister of Health on November 28 if he would give recognition to the Council of Regional Hospital Consultants and Specialists Association as being representative of the majority of consultants and specialists in the Health Service; and if he would consult with the medical profession to secure a review of

*See *Brit. med. J.*, November 19, p. 1531.

the constitution of the staff side of the Whitley Committee B to give a fairer balance between teaching and regional hospital representatives. Mr. ENOCH POWELL replied, "No." The second part of the question was a matter for the staff side concerned. Mr. PAVITT said that 85% of consultant specialists were working with regional hospitals, and 90% of the clinical work was being done by these consultant specialists in the regions. Why should they not have their proper place on all committees, including the Whitley Committee? Mr. POWELL replied that he was aware of these facts, but he was satisfied that the Joint Consultants' Committee adequately represented these consultants.

T.T. Herds and Tuberculosis

Mr. JOHN HALL (Wycombe, Con.) asked the Minister of Health what percentage of cattle in England and Wales was attested free from tuberculosis in 1929 and 1959, respectively; and what were the pulmonary and non-pulmonary tuberculosis notifications in those years, expressed as a percentage of the population. Mr. POWELL stated in a writtten reply on November 29 that he was informed that at the end of 1959, 94% of all cattle in England and Wales were attested free from tuberculosis, whereas in 1929 no herds were officially regarded as being of equivalent status, and in 1932 it was estimated that 40% of all cows were infected with tuberculosis. The second part of the question was answered in the following table:

Year		Notifications	Rate per 100,000
1929	Pulmonary	52,031	131
	Non-pulmonary ..	16,310	41
1959	Pulmonary	24,280	53
	Non-pulmonary ..	2,820	6

Mr. HALL asked the Secretary of State for Scotland for the corresponding figures for Scotland. Mr. J. MACLAY said the Attested Herds Scheme came into operation in 1935. Substituting that year for 1929, the information sought was as follows:

	1935	1959
Percentage of cattle population attested	0·27	100
Tuberculosis notifications per 100,000 population:		
Pulmonary	101	72
Non-pulmonary	60	11

Voluntary Funds for Hospitals

Dr. DONALD JOHNSON (Carlisle, Con.) asked what steps the Minister of Health was taking to encourage voluntary help in the raising of funds towards the financing of projects for new hospitals or new hospital departments. Mr. POWELL stated that it was his hope that all concerned with the development of the hospital service would not fail to make full use of contributions towards it which voluntary funds might offer.

Dr. JOHNSON said there was a general impression that voluntary funds for hospitals could only be used for purposes not directly connected with the running of the hospitals, such as patients' comforts. Would the Minister take all possible steps to dispel this impression? Mr. POWELL said he hoped that the question and his reply would help to do that. Dr. EDITH SUMMERSKILL asked if there should not be some central supervision so that all hospitals might be treated equally. Mr. POWELL: What I have said is not inconsistent with the necessity for central supervision.

Hospital Building Being Reviewed

Mr. J. PRIOR (Lowestoft, Con.) asked the Minister on November 30 when he proposed to introduce new methods of allocating finance for capital projects for regional hospital boards. Mr. POWELL: I am reviewing the whole management of the hospital capital programme, but cannot yet say when any changes will be introduced.

Hospital Beds Costs

Mr. FRANK MCLEAVY (Bradford, East, Lab.) asked the Minister of Health on December 2 what was the average weekly cost of a bed in hospitals generally, and the similar cost in the London teaching hospitals. Mr. POWELL stated that for acute hospitals the average weekly costs per patient for the year ended March 31, 1960, were:

	£ s. d.
Non-teaching hospitals	25 16 7
Teaching hospitals (London)	36 9 7
Teaching hospitals (Provinces)	30 4 11

Medico-Legal

ADOPTION PAYMENTS

[FROM OUR LEGAL CORRESPONDENT]

Mr. Christmas Humphreys, Q.C., as Deputy Chairman of the East Kent Quarter Sessions, on November 16 sentenced Mrs. Rhuane Antoinette Laslett, aged 40, to nine months' imprisonment (*The Times*, November 17).

Mrs. Laslett, the former matron of a nursing-home (now closed) at Ramsgate, Kent, pleaded not guilty to charges of two types: firstly, five charges that she received payments totalling £155 for or in consideration of making arrangements for the adoption of infants between March and June of this year; and secondly, three charges that she fraudulently converted to her own use sums totalling £75 entrusted to her in respect of nursing-home fees and for providing baby clothing. Mrs. Laslett was found guilty on one charge only—namely, that she fraudulently converted to her own use £30 entrusted to her by an American airman's wife for nursing-home fees.

In her evidence, Mrs. Laslett said that she started a children's nursery in 1958 and later opened a home for unmarried mothers. The main purpose of the home was to look after children, most of whom were partly coloured.

It was alleged by the prosecution that Mrs. Laslett had told American would-be adopters of children in the home that she was born in Carolina and married an American Air Force major, whereas in fact she was born in London and married an Australian in 1947, being divorced five years later. Mrs. Laslett said that she remembered little of her life before 10 years ago, and she had received treatment for amnesia. She did not remember her marriage, nor where she was during the war. She denied that she told people stories about her past in order to get money from them.

Mrs. Laslett admitted having placed children for adoption. She said it was cheaper for Americans to get babies in England than in Germany. In almost all cases she made the initial arrangements through the judge-advocate: she advised prospective adopters to engage a solicitor, and she notified the children's officer when the child was handed over. She said, further, that in some cases she had suggested to some couples that they should pay nursing-home fees, and other couples had made voluntary donations to the home. The judge-advocate at Wethersfield, she said, had told her it was illegal to make a payment for a child, but there was no objection to a donation. Evidence was given of requests by Mrs. Laslett for money for particular purposes.

After Mrs. Laslett's conviction for fraudulent conversion of the £30, her counsel put in a medical report which, he said, showed her to be mildly psychopathic and hysterical.

Adoption Act

Section 50 of the Adoption Act, 1958, provides for a maximum penalty of six months' imprisonment or a fine of £100 or both to be imposed on any person who gives

or receives or attempts to obtain "any payment or reward for or in consideration of (*a*) the adoption by that person of an infant; (*b*) the grant by that person of any consent required in connexion with the adoption of an infant; (*c*) the transfer by that person of the care and possession of an infant with a view to the adoption of the infant; or (*d*) the making by that person of any arrangements for the adoption of an infant." The better view of this provision is that it does not prohibit payments in respect of expenses, so long as these payments are in no way an inducement towards the completion of the adoption. However, it is clear that any payments made in connexion with an adoption are open to misconstruction. Section 50 provides that no offence is committed if payments are made in certain defined circumstances. It would be wise to make no payments in connexion with an adoption unless those payments come within the terms of that proviso. The terms of the proviso are as follows:

"This section does not apply to any payment made to an adoption society or local authority by a parent or guardian of an infant or by a person who adopts or proposes to adopt an infant, being a payment in respect of expenses reasonably incurred by the society or authority in connexion with the adoption of the infant, or to any payment or reward authorized by the court to which an application for an adoption order in respect of an infant is made."

Vital Statistics

Infectious Diseases

Areas where numbers of notifications were high in the latest two weeks for which figures are available.

	Week Ending Nov. 19	Week Ending Nov. 26
Dysentery		
Gloucestershire	13	**21**
Bristol C.B.	13	**19**
Lancashire	77	**105**
Liverpool C.B.	21	**25**
Chorley M.B.	0	**10**
Urmston U.D.	15	**14**
Nottinghamshire	57	**31**
Carlton U.D.	20	**15**
Bingham R.D.	25	**13**
Yorkshire West Riding	72	**75**
Leeds C.B.	25	**27**
Glasgow	102	**112**
Measles		
Lancashire	1,590	**1,647**
Liverpool C.B.	221	**229**
Oldham C.B.	165	**143**
Yorkshire West Riding	624	**488**
Bradford C.B.	163	**98**
Glamorganshire	138	**258**
Swansea C.B.	51	**136**
Food Poisoning		
Hampshire	0	**18**
Andover M.B.	0	**15**
Cheshire	0	**93**
Crewe M.B.	0	**90**
Glasgow	34	**41**
Diphtheria		
Glasgow	0	**2**

Births and Deaths in Northern Ireland

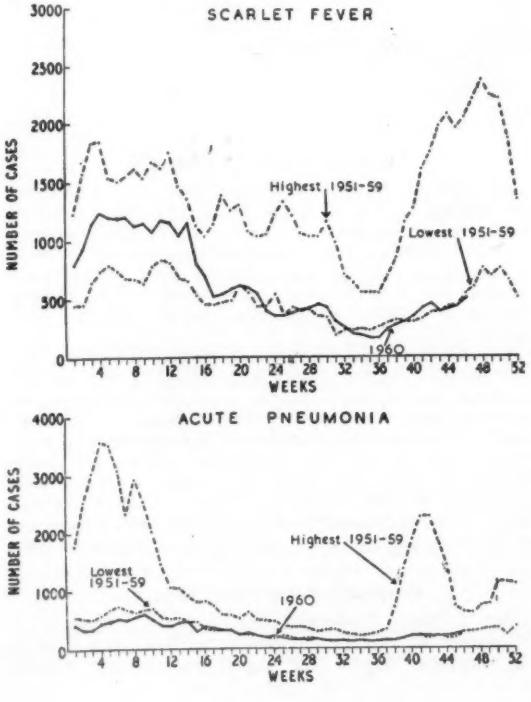
The estimated population of Northern Ireland in 1959 was 1,407,700, a slight increase on the previous year. Births, at 30,809, were more than twice the number of deaths, and the birth rate of 21.9 per 1,000 population was higher than in any previous year since 1948, and compares with the rate of 16.5 in England and Wales. The death rate of 10.9 was 0.1 above the rate for 1958. The infant death rate (28 per 1,000 live births) was the same as that of 1958: in England and Wales the infant death rate in 1959 was 22. Deaths from tuberculosis numbered 143, and the death rate from this disease was the lowest ever recorded in Northern Ireland. The death rate from cancer was 1.60 per 1,000 population, which is the lowest rate in the British Isles. Between 1949 and 1959 deaths from cancer of the lung increased by 106% (168 in 1949 and 346 in 1959), though the death rate from this form of cancer remains lower than those in England and Wales and in Scotland. As in 1958, maternal deaths numbered 17, the lowest figure yet recorded in Northern Ireland. The marriage rate (6.8 per 1,000 population) increased for the first time since 1955: the average age of men marrying was 28.3 and of women 25.3.—The Annual Report of the Registrar-General of Northern Ireland for 1959. H.M.S.O., Belfast. Price 6s. net.

Venereal Disease in the R.A.F.

There were 246 new cases of venereal disease among R.A.F. personnel serving in the United Kingdom in 1957. The rate per 1,000 of strength was 1.5. The lowest rate in pre-war years was 5.1 in 1936, and the highest rate in the 34 years between 1924 and 1957 was 23.1 in 1946. The latest figures are not exactly comparable with the older ones, since patients treated only as out-patients were not included in the statistics until 1952, when the rate was 2.4. The V.D. rate per 1,000 of strength serving overseas in 1957 was 20.2 compared with 17.0 in 1956 and 51.4 in 1947.—*Report on the Health of the Royal Air Force and Women's Services of the Royal Air Force for the Year 1957.* Air Ministry, London S.W.1.

Graphs of Infectious Diseases

The graphs below show the uncorrected numbers of cases of certain diseases notified weekly in England and Wales. Highest and lowest figures reported in each week during the years 1951–9 are shown thus ------, the figures for 1960 thus ———. Except for the curves showing notifications in 1960, the graphs were prepared at the Department of Medical Statistics and Epidemiology, London School of Hygiene and Tropical Medicine.



INFECTIOUS DISEASES AND VITAL STATISTICS

Summary for British Isles for week ending **November 19** (No. 46) and corresponding week 1959.

Figures of *cases* are for the countries shown and London administrative county. Figures of *deaths* and *births* are for the whole of England and Wales (London included), London administrative county, the 17 principal towns in Scotland, the 10 principal towns in Northern Ireland, and the 14 principal towns in Eire.

A blank space denotes disease not notifiable or no return available.

The table is based on information supplied by the Registrars-General of England and Wales, Scotland, N. Ireland, and Eire, the Ministry of Health and Local Government of N. Ireland, and the Department of Health of Eire.

CASES	1960					1959				
	Eng. & Wales	Lond.	Scot.	N. Ire.	Eire	Eng. & Wales	Lond.	Scot.	N. Ire.	Eire
Diphtheria ..	2	0	0	0		21	18	1	0	
Dysentery ..	492	72	155	2	8	572	70	161	4	54
Encephalitis, acute	2	0	0	0		2	0		0	
Enteric fever:										
Typhoid ..	5	0	0	0		3	1	0	0	6
Paratyphoid ..	4	0	0	0		0	0	0	0	1 (B)
Food-poisoning ..	151	41	34	0		206	20	14	0	
Infective enteritis or diarrhoea under 2 years				14	28				10	39
Measles*	5,412	302	162	35	68	984	16	19	19	34
Meningococcal infection	13	0	7	0	2	10	0	3	0	1
Ophthalmia neonatorum	22	3	1	0		28	4	5	0	
Pneumonia† ..	284	18	135	1		267	13	152	2	1
Poliomyelitis, acute:										
Paralytic ..	11	4	0	0	3	11	3	1	0	
Non-paralytic ..	4	0	0			5	1	1		
Puerperal fever§ ..	133	27	12	1		186	35	11	0	
Scarlet fever ..	499	32	66	34	27	1,382	69	150	39	37
Tuberculosis:										
Respiratory ..	399	69	70	16		446	58	71	14	
Non-respiratory	56	2	8	1		50	1	12	2	
Whooping-cough	1,055	73	101	8	39	714	62	152	6	118

DEATHS	1960					1959				
	Eng. & Wales	Lond.	Scot.	N. Ire.	Eire	Eng. & Wales	Lond.	Scot.	N. Ire.	Eire
Diphtheria ..	0	0	0	0	0	0	0	0	0	0
Dysentery ..	1	0		1		1	0		0	
Encephalitis, acute					0		1			0
Enteric fever ..	0	0	0	0		0	0	0	0	
Infective enteritis or diarrhoea under 2 years	6	0	0	2	1	7	0	1	0	0
Influenza	15	0	1	1	1	24	0	1	0	0
Measles		0	0	0	0		0	0	0	0
Meningococcal infection ..		0	0				0	0		
Pneumonia ..	540	52	20	11	7	544	46	17	13	5
Poliomyelitis, acute	0	0		0	0	2	0		0	0
Scarlet fever ..		0	0	0	0		0	0	0	0
Tuberculosis:										
Respiratory ..	73	6	5	1	5	94	3	4	1	4
Non-respiratory			0	0	1		1	0	0	0
Whooping-cough	0	0	0	0	0	1	0	0	0	0
Deaths 0–1 year	318	29	15	11	11	302	30	41	13	13
Deaths (excluding stillbirths) ..	10,460	832	617	131	154	10,822	864	587	129	158
LIVE BIRTHS ..	14,446	1211	907	256	471	13,595	1149	888	231	354
STILLBIRTHS ..	292	19	20			292	23	25		

* Measles not notifiable in Scotland, whence returns are approximate.
† Includes primary and influenzal pneumonia.
§ Includes puerperal pyrexia.

Medical News

Royal Society's New President

Sir HOWARD FLOREY, whose election as President of the Royal Society is the subject of the leading article on p. 1722, was born in Adelaide in 1898, and was educated at St. Peter's College and Adelaide University, where he graduated in medicine in 1921.

[*Camera Press*

He went up to Magdalen College, Oxford, as a Rhodes Scholar, and later studied at Cambridge and at the London Hospital. From 1925 to 1926 he was Rockefeller Travelling Fellow in the United States. In 1927 he became Huddersfield lecturer in special pathology at Cambridge, and then professor of pathology at Sheffield from 1931, before taking up the chair of pathology at Oxford in 1935. He was elected F.R.S. in 1941, and in 1945 he shared the Nobel Prize for Medicine. He has been awarded the Royal Society's Royal and Copley Medals and holds many other awards and honorary distinctions. He has played a part in setting up the Australian National University, being especially connected with the John Curtin School of Medical Research. His publications include contributions to scientific journals in physiological and pathological subjects, *Antibiotics* (with others), *Lectures on General Pathology* (as editor and contributor), and *General Pathology*. Sir Howard is the first Australian to be president of the Royal Society.

New Officers of the Royal Society

The following new officers of the Royal Society have been elected: *treasurer*, Sir ALEXANDER FLECK; *foreign secretary*, Sir PATRICK LINSTEAD; Sir LINDOR BROWN and Sir WILLIAM HODGE have been re-elected biological secretary and physical secretary respectively. Among those elected to membership of the Council is Dr. R. G. MACFARLANE.

Remploy

Remploy, the national organization which provides work for more than 6,300 seriously handicapped people in 90 factories in Great Britain, made for the first time sales worth well over £5m. in the year ending March 31. This figure, again for the first time, outstripped the cost of wages and new materials. A small number of schizophrenic patients—a new departure—have been taken into Remploy after attending a rehabilitation unit. Three factories previously reserved for those handicapped by tuberculosis have been converted to general use. (*Annual Report and Accounts*, Remploy Ltd.)

Humboldt University, Berlin, and Charité Hospital

The Humboldt University of Berlin celebrated its 150th anniversary and the Charité Hospital its 250th anniversary from November 6 to 20.

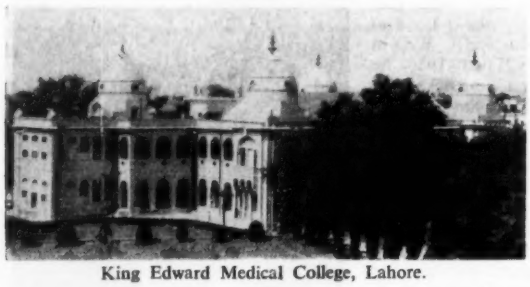
Symposia, conferences, discussions, and exhibitions were offered to participants by the various faculties, including the medical faculty. The faculties of philosophy and medicine spent three days discussing their understanding of humanism and medicine, representational thinking, cybernetics and its role in

medicine, the concept of illness, and, lastly, theory and practice in medicine. The physiology symposium, spread over three days, was devoted to an exhaustive analysis of the structure and function of the red blood cell. Energetics, cell stability, and biochemical interrelations were treated by workers drawn from many countries. The hospitality offered by university dignitaries, ministerial houses, and student bodies encouraged the informal exchange of ideas and ideals.

Centenary, King Edward Medical College, Lahore

The centenary of the King Edward Medical College, Lahore, was celebrated on November 16 in the School Assembly Hall at Lahore, the President of Pakistan, Field Marshal MOHAMMAD AYUB KHAN, presiding.

The ceremony was attended by Lieutenant-General W. A. BURKI, Pakistan Minister of Health, Mr. AKHTER HUSSEIN,



King Edward Medical College, Lahore.

Minister for Kashmir Affairs, MALIK AMIR MOHAMMED KHAN, Governor of West Pakistan, and Mr. JEHAN S. SALEH, Iranian Minister of Health. The United Kingdom was represented by Professor IAN AIRD, Sir ALEXANDER BIGGAM, Mr. M. D. BLACK (formerly professor of obstetrics at the College), Professor J. H. DIBLE, Lieutenant-Colonel A. M. DICK (principal of the College from 1939 to 1941), Sir ALEXANDER DRUMMOND, Dr. DONALD HUNTER, Mr. R. H. O. B. ROBINSON, and Professor CHARLES WELLS. They presented addresses of congratulation from the Minister of Health, the Royal Colleges of Surgeons of England and of Edinburgh, the Royal College of Physicians, the Royal College of Physicians, Edinburgh, the Royal Army Medical College, Millbank, the Postgraduate Medical School of London, and the Edinburgh Postgraduate Board for Medicine. Lieutenant-Colonel B. H. SAYID, director of the Pakistan Health Services, gave an address of welcome, to which the President replied, and Lieutenant-Colonel S. M. K. MALLICK, dean of the faculty of medicine of the Punjab University, delivered the Centenary Oration. The ceremony was followed by a three-day programme of scientific, social, athletic, and cultural events.

The Heberden Society

Lord NATHAN was the principal speaker at the annual dinner of the Heberden Society on December 2, the president, Dr. F. DUDLEY HART, being in the chair. In proposing the health of the Society Lord Nathan gave some illuminating historical examples of how disease may dangerously cloud the judgment of men in power. In a much lighter vein, Dr. T. F. Fox kept the company laughing with his flights of fancy into the present and past, recollecting at the end that he was replying to the toast of "The Guests."

British Orthopaedic Association

The Robert Jones Gold Medal and Prize has been awarded to Dr. MYER MAKIN, of Jerusalem, for an essay on "Osteogenesis by Vesical Mucosal Transplant," and to Mr. G. S TUPMAN, of Scarborough, for an essay on "Bone Growth in Normal Children and its Relationship to Skeletal Maturation."

Central Midwives Board

In their report for the year which ended on March 31 the Central Midwives Board say that there was a further increase in live births in the first quarter of 1960—198,075 as against corresponding figures of 191,860 in 1959, and 169,190 in 1955. During the year 16,582 midwives notified their intention to practise, 137 more than the previous year. The increasing number of pupil midwives alleviated to some extent the burden falling on midwifery staffs, particularly in the larger hospital units. The Board assisted the Ministry of Health in its detailed investigation of the shortage of midwives.

Delegation of Soviet Rheumatologists

A reception was given by the British Council in honour of the delegation of Soviet rheumatologists on December 1. Professor ANATOLIJ INNOKENT'EVICH NESTOROV, Member of the Academy of Sciences and director of the Moscow Institute of Rheumatism, gave a short talk on "Immunology in the Diagnosis of Rheumatism" before the reception.

Confectioners Benevolent Fund

The Confectioners Benevolent Fund would be pleased to hear from doctors having needy patients who are eligible for help from the fund. Pensions are considered for those who are 60 or over—and in some circumstances for their dependants—who have worked in the confectionery (sweets) trade for at least 10 years during their lives, while grants to supplement medical treatment may be made to those who are currently employed in the trade irrespective of length of service. The fund employs a full-time social worker, and details of the services which it can offer may be obtained from the Confectioners Benevolent Fund, 11 Green Street, London W.1 (MAYfair 8971).

David Anderson-Berry Prize

A David Anderson-Berry Medal in silver-gilt and not less than £100 sterling ($280) will be awarded in 1961 by the Council of the Royal Society of Edinburgh for recent work on the effects of *x* rays and other forms of radiation on living tissues. Published work will be taken into consideration if submitted to the Society with the application. Proposals for the prize may be made on behalf of others. Applications and proposals must reach the General Secretary, Royal Society of Edinburgh, 22/24 George Street, Edinburgh 2, Scotland, by March 31.

Change of Address

King Edward's Hospital Fund for London, Hospital Personal Aid Service for the Elderly, has moved to 24–26 London Bridge Street, London S.E.1. (Tel.: HOP 4255.)

The Elderly Invalids' Fund (Incorporated) has moved to 24–26 London Bridge Street, London S.E.1 (Second Floor). (Tel.: HOP 2497.)

The Reginald Carter Foundation for Alcoholic Patients has removed to new premises at 34 Seymour Street, London W.1 (Tel.: AMBassador 6689), and will in future be known as the Carter Foundation.

Christmas Cards

Christmas cards may be obtained from the National Council for the Unmarried Mother and Her Child (21 Coram Street, London W.C.1 (TERminus 1890)); the National Society for Mentally Handicapped Children (125 High Holborn, London W.C.1 (CHAncery 8395)); and the Multiple Sclerosis Society (12 Stratford Road, London W.8).

Scientific Film Association

The Scientific Film Association is revising its records of medical films for a new edition of its *Guide*, and would be pleased to receive details of any films not previously included in its publications, or information about where such details may be obtained. The S.F.A.'s address is 3 Belgrave Square, London S.W.1.

British Society for Haematology

Membership of this new Society is open to scientists and medical practitioners engaged in the study and practice of haematology. At the first meeting a symposium on leukaemia was held. The second meeting will take place in Oxford on April 8 under the chairmanship of Professor L. J. WITTS. Details about the Society may be obtained from the provisional secretary, Dr. ROSEMARY BIGGS, Blood Coagulation Research Unit, Churchill Hospital, Oxford.

Herta Oberheuser

The Schleswig-Holstein administrative court has rejected HERTA OBERHEUSER'S appeal against the withdrawal in 1958 of her licence to practise publicly (see *Journal*, November 26, p 1612), and she has been ordered to pay costs. (*Daily Telegraph*, December 5.)

In Brief

The Invalid Children's Association is planning to set up a school for children who are unable to speak because of emotional deprivation.

People in the News

Sir ARTHUR MASSEY, formerly Chief Medical Officer of the Ministry of Pensions and National Insurance, is to be the new Chairman of the Council of the Royal Society of Health from January 1. He has been associated with the Society for over 30 years, and has been a member of its Council for the past 18 years.

Mr. J. CONWAY, ophthalmic surgeon to the Whipps Cross Hospital Regional Eye Centre and to New End Hospital, London, has been awarded a World Health Organization Fellowship to study at eye clinics abroad.

Dr. LOUIS VERHOESTRAETE, formerly chief of the health promotion branch of the Pan-American Sanitary Bureau, has taken up his appointment as Director, Division of Health Protection and Promotion, at the headquarters of the World Health Organization in Geneva.

COMING EVENTS

Lock Lecture.—Professor J. J. PRITCHARD, "Ossification," December 14, 5 p.m., Maurice Bloch Lecture Theatre, Royal Faculty of Physicians and Surgeons, 242 St. Vincent Street, Glasgow. Open to all medical practitioners.

Medical Group, Royal Photographic Society.—Meeting, January 5, 7 p.m., at the Society's House, 16 Princes Gate, London S.W.7. Speakers: Mr. C. ENGEL, F.R.P.S., and an expert in television instrumentation, "Closed Circuit Television in Medical Research and Teaching."

Hunterian Lecture.—Professor FRITZ LINDER (Berlin), "A Survey of Surgery in Germany, with Special Reference to Pulmonary Lesions," January 23, 8.30 p.m., Livery Hall, Guildhall, Basinghall Street entrance.

SOCIETIES AND LECTURES

A fee is charged or a ticket is required for attending lectures marked ●. Application should be made first to the institution concerned.

Monday, December 12

MANCHESTER MEDICAL SOCIETY: SECTION OF GENERAL PRACTICE.—At Large Anatomy Theatre, Medical School, Manchester University, 8.30 for 9 p.m., film: An Inquiry into General Practice. A discussion will follow.
POSTGRADUATE MEDICAL SCHOOL OF LONDON.—4 p.m., Professor D. V. Hubble: Steatorrhoea in Childhood.
ST. ANDREWS UNIVERSITY.—At Demonstration Room, Department of Medicine, 4 p.m., Dr. M. G. Coyle: Placental Steroid Hormones.

Tuesday, December 13

BIRMINGHAM MEDICAL INSTITUTE: SECTION OF PSYCHIATRY.—At 36 Harborne Road, Edgbaston, 8 p.m., Mr. J. G. Hamilton: Surgical Treatment of Intractable Pain.
ILFORD MEDICAL SOCIETY.—At King George Hospital, Ilford, 8.45 p.m., Mr. A. M. A. Moore: The Apothecaries of London. Members of Stratford Division, B.M.A., are invited.
INSTITUTE OF DERMATOLOGY.—5.30 p.m., Dr. R. H. Marten: Moniliasis.
LEEDS NEUROLOGICAL SCIENCES COLLOQUIUM, 1960.—At Littlewood Hall, General Infirmary at Leeds, 5.15 p.m., Mr. Douglas Northfield: Tumours Involving the Floor of the Third Ventricle.
MANCHESTER MEDICAL SOCIETY: SECTION OF SURGERY.—At Clinical Sciences Building, York Place, 4.30 for 5 p.m., Mr. Rodney Smith: Expanding Scope of Hepatic Surgery.
OSLER CLUB OF LONDON.—At Royal College of Physicians of London, 8 p.m., subject: Thomas Linacre (1460-1524). Speakers, Dr. C. Newman, Professor R. Weiss, and Mr. A. C. Crombie.
ROYAL COLLEGE OF SURGEONS OF ENGLAND.—5 p.m., Erasmus Wilson Demonstration by Dr. M. S. Israel: Chronic Inflammatory Lesions of the Small Intestine.

Wednesday, December 14

EUGENICS SOCIETY.—At Royal Society, Burlington House, Piccadilly, W., 5.30 p.m., Dr. A. C. Stevenson: Modern Trends in the Population Genetics of Man.
HARVEIAN SOCIETY OF LONDON, 11 Chandos Street, W.—8.15 p.m., Dr. S. C. Truelove: Ulcerative Colitis.
INSTITUTE OF DERMATOLOGY.—5.30 p.m., Dr. R. W. Riddell: Subcutaneous and Systemic Mycoses.
INSTITUTE OF DISEASES OF THE CHEST.—5 p.m., Dr. J. R. May: Some Considerations Regarding Immunity to *Haemophilus influenzae*.
INSTITUTE OF UROLOGY.—4.30 for 5 p.m., Dr. R. C. B. Pugh: Tumours of the Testicle.
MANCHESTER MEDICAL SOCIETY: SECTION OF PATHOLOGY.—At Large Anatomy Theatre, Medical School, Manchester University, 4.30 for 5 p.m., Dr. L. L. R. White: Histopathology of Virus Infections.
ROYAL COLLEGE OF SURGEONS OF ENGLAND.—5 p.m., Hunterian Lecture by Professor Owen Daniel: Complication of Diversion of the Urinary Stream.
ROYAL INSTITUTE OF PUBLIC HEALTH AND HYGIENE.—3.30 p.m., Mr. H. W. Symons: Hygiene in Frozen Food Factories (Illustrated).
ROYAL STATISTICAL SOCIETY.—At London School of Hygiene and Tropical Medicine, 5.15 p.m., Mr. R. H. Daw: Comparison of Male and Female Mortality Rates.
ST. ANDREWS UNIVERSITY.—At Demonstration Room, Department of Medicine, 2.30 p.m., Dr. A. C. Turnbull: Uterine Function in Late Pregnancy and Labour.

Thursday, December 15

BRITISH MEDICAL ASSOCIATION.—At B.M.A. House, Tavistock Square, London W.C., 5 or 5.30 p.m., lecture-discussion by Mr. H. Osmond-Clarke: Fractures Around the Wrist.
● INSTITUTE OF OBSTETRICS AND GYNAECOLOGY.—At Queen Charlotte's Hospital, 11.15 a.m., Mr. I. Marshall Scott: Some Problems of the Occipito-posterior Position.
NUFFIELD ORTHOPAEDIC CENTRE.—At Wingfield-Morris Orthopaedic Hospital, Oxford, 8.30 p.m., Professor J. Trueta: An Account of a Visit to Orthopaedic Centres in the United States of America.
ROYAL COLLEGE OF SURGEONS OF ENGLAND.—5 p.m., Arris and Gale Lecture by Dr. Leslie Turner: Structure of Arachnoid Granulations, with Observations on their Physiological and Pathological Significance.

Friday, December 16

BIOCHEMICAL SOCIETY.—At Physiology Theatre, Guy's Hospital Medical School, 10.10 a.m., 401st meeting.
INSTITUTE OF DISEASES OF THE CHEST.—5 p.m., Dr. J. Smart: clinical demonstration.
KENT AND CANTERBURY HOSPITAL.—8 p.m., clinical meeting.
LONDON UNIVERSITY.—At No. 1 Lecture Theatre, University College Hospital Medical School, 5 p.m., special university lecture in medicine by Dr. E. H. Kass (Harvard): Pathogenesis of Pyelonephritis.
ROYAL COLLEGE OF SURGEONS OF EDINBURGH.—3.30 p.m., Professor D. F. Cappell: Some Points in the Diagnosis of Certain Tumours of the Skin.

APPOINTMENTS

HOSPITAL FOR SICK CHILDREN, Great Ormond Street, London W.C.—H. B. Eckstein, M.D., F.R.C.S., Surgical Registrar; L. Harris, M.B., Ch.B., D.P.M., Resident Registrar to Neurological and Neurosurgical Departments; Janet Goodall, M.B., Ch.B., D.C.H., D.Obst.R.C.O.G., House-physicians; H. J. H. Fry, M.B., B.S., F.R.C.S., House-surgeon to Orthopaedic and Plastic Departments; Clare Neville Smith, M.B., B.Chir., D.P.H., Assistant Resident Medical Officer, Tadworth.
LIVERPOOL REGIONAL HOSPITAL BOARD.—R. G. Snow, M.B., Ch.B., F.F.A. R.C.S., Part-time Consultant Anaesthetist to Chester area; Dorothy C. Oswald M.B., B.Ch., Assistant Pathologist to Birkenhead Hospital Management Committee.
MANCHESTER REGIONAL HOSPITAL BOARD.—L. Grimshaw, M.B., Ch.B., D.P.M., Consultant Psychiatrist (9 half-days weekly), Bury and Rossendale Group of Hospitals; J. A. Krawiecki, M.B., Ch.B., D.P.M., Consultant Psychiatrist (9 half-days weekly), West Manchester and Springfield and Swinton Groups of Hospitals; A. C. Fleming, M.B., B.S., D.P.M., Whole-time Consultant Psychiatrist and Medical Superintendent, Calderstones Hospital, Whalley, near Blackburn; W. J. Metcalfe, M.B., Ch.B., F.R.C.S., Consultant Surgeon (8 half-days weekly), Blackburn and District Group of Hospitals; D. C. Simpson, M.B., Ch.B., Whole-time Senior Casualty Officer, Withington Hospital, near Manchester.

BIRTHS, MARRIAGES, AND DEATHS

BIRTHS

Lockett.—On November 26, 1960, at Battle Hospital, Reading, to Gillian, wife of Dr. Harry Lockett, a brother for Stephen, Felicity and Sarah—Philip Bruce.
Wiley.—On November 22, 1960, at the Western Hospital, Toronto, to Pamela, wife of Dr. A. M. Wiley, a son.

DEATHS

Ahern.—On October 11, 1960, Edward Denis Ahern, M.B., B.S., F.R.A.C.S., of Brisbane, Queensland.
Balf.—On October 14, 1960, at Kamloops, British Columbia, Canada, Charles Lawson Balf, B.M., B.Ch., M.R.C.P., D.C.H., aged 38.
Barnetson.—On November 17, 1960, at Corstorphine House, Edinburgh, Robert Balfour Barnetson, M.D.
Bell.—On November 22, 1960, in a nursing-home, Bournemouth, Hants, Whiteford John Edward Bell, D.S.O., M.B., Ch.B., D.P.H., Lt.-Colonel, R.A.M.C., retired, aged 79.
Brushfield.—On November 14, 1960, at Bognor Regis, Sussex, Archibald Nadauld Brushfield, M.R.C.S., L.R.C.P., aged 90.
Carson.—On November 11, 1960, at Pinewood Hospital, Wokingham, Berks, James Coburn Carson, M.B., B.Ch., D.T.M., late of Malaya.
Court.—On November 11, 1960, at 644 Derby Road, Wingerworth, Chesterfield, Derbyshire, Arthur Court, M.B., B.Ch., formerly of Staveley, Chesterfield, aged 94.
MacDiarmid.—On November 17, 1960, in Aberdeen, Alexander James MacDiarmid, M.B., Ch.B.
Mackay.—On November 13, 1960, in hospital, Chichester, Sussex, Roderick Mackay, M.B., Ch.B., of Felpham, Bognor Regis, Sussex, formerly of Peckham, and Forest Hill, London S.E., aged 81.
Phillips.—On November 19, 1960 at the Duke of York Home, Bradford, Yorks, James Phillips, F.R.C.S.Ed., J.P., of 4 Marlborough Road, Bradford, aged 86.
Price.—On November 17, 1960, at Eastway, Witheridge, Devon, Ernest Aubrey Price, M.R.C.S., L.R.C.P., late of Woodbury, Devon, aged 82.
Rathbone.—On November 14, 1960, Mary Rathbone, L.M.S.S.A., of the Popiars, Westington Chipping Campden, Glos, aged 93.
Stirling.—On November 8, 1960, at 2 Craigendoran Avenue, Helensburgh, Dunbartonshire, William Neilson Stirling, L.R.C.P.&S.Ed., L.R.F.P.S., late of East Pakistan.
Tinley.—On November 15, 1960, in a nursing-home, Whitby, Yorks, William Edwyn Falkingbridge Tinley, M.D., J.P., aged 87.
Veitch.—On November 19 1960, at St. Neots, Hunts, Harry Cecil Craven Veitch, M.R.C.S., L.R.C.P.
Woodside.—On November 13, 1960, at 23 Inverclyde Road, Parkstone, Dorset, Robert Woodside, M.D., Ch.P.

Any Questions ?

We publish below a selection of those questions and answers which seem of general interest. It is regretted that it is not possible to supply answers to all questions submitted.

Kveim Test for Sarcoidosis

Q.—*What is the Kveim antigen? What is its value in the diagnosis of sarcoidosis, and how is it used?*

A.—An intradermal test providing histological proof of sarcoidosis was introduced by Kveim in 1941.[1] It has since been extensively used in the United States and Scandinavia, although but infrequently in Great Britain. This is a pity, because it is a simple, safe, and specific out-patient technique. Besides giving histological proof of sarcoidosis, it also provides an index of activity of the disease, an index of progress, and, by serial biopsy, a method of evaluating various treatments.

The antigen is prepared by emulsifying sarcoid tissue in physiological saline in a dilution of 1:10 wet weight. Sarcoid tissue from any source, including spleen, skin, or tonsil, can be used, but a sarcoid lymph-node produces the most potent antigen. Apart from aerobic and anaerobic cultures for sterility, some antigen should be inoculated into a guinea-pig to ensure that it is free from tubercle bacilli. The decanted suspension is sterilized by heat at 56° C. for two hours on two successive days.

The antigen is injected intradermally into the flexor aspect of the forearm in a dose of 0.2 ml., using a wide-bore needle. In patients with sarcoidosis, a dusky-red papule develops after a few days and it is present as a distinct palpable nodule at the end of one month; biopsy reveals sarcoid tissue. The test is positive in approximately three-quarters of patients with sarcoidosis.[2] False-positive reactions do not occur in other diseases. It is more likely to be positive in the acute forms than in the late chronic fibrotic stage of the disease. It is particularly helpful in providing histological proof in the syndrome of erythema nodosum, bilateral hilar lymphadenopathy, and transient polyarthritis.

The antigen is not produced commercially. There is no difficulty in preparing it, but supplies are dependent on a readily available source of sarcoid tissue.

REFERENCES

1 Kveim, A., *Nord. med.*, 1941, 9, 169.
2 James, D. G., and Thomson, A. D., *Quart. J. Med.*, 1955, n.s. 24, 49.

Estimating Reaction-time of Drivers

Q.—*Is there any simple manœuvre or apparatus, suitable for a general practitioner's consulting-room, for estimating a patient's time of reaction? I am constantly being asked to examine people for fitness to drive.*

A.—Reaction-time in relation to driving vehicles is generally held to mean the time that elapses between the operation of a warning signal and the application of the brakes, for example, of a Miles motor trainer. There is no simple method of testing this. An individual's reaction-time may vary considerably, as it is affected by such factors as distraction, emotion, and fatigue. So far as drivers on the road are concerned, it is the younger ones—with the shortest reaction-times—who have high accident rates. There is little point in recording a person's reaction-time, for, after registering a very quick reaction in the test, there is nothing to stop him having an accident on the road due to vaguely defined but important factors such as carelessness, inattention, and so on.

The main value of the reaction-time test is to show drivers how far—as much as 20 to 30 feet (9.2 m.) at 30 miles (48 kilometres) per hour—they would travel in an emergency before they even applied the brakes. An essential of safe driving is anticipation and looking well ahead rather than quickness of reaction in emergency. Good—i.e., safe—drivers rarely get into emergency situations. In cases of permanent and serious slowing of the reaction-time, it is probable that clinical signs of disease would be present.

Several studies have been made of the assessment of fitness to drive vehicles, and the British Medical Association's memorandum on Medical Standards for Road, Rail, and Air Transport[1] will be found helpful. The Milroy Lectures, 1960,[2] also review this subject and give many references.

REFERENCES

1 *Brit. med. J. Supplement*, 1954, 1, 117.
2 *Lancet*, 1960, 1, 989 and 1039.

Promoting Union of Fractures

Q.—*What treatment may be given to promote union of a Pott's fracture in a man aged 75? Would calcium or calciferol help or would they tend to aggravate atheromatous changes?*

A.—Union of fractures when the patient is on a normal diet is not helped by giving calcium or calciferol. A Pott's fracture in a man aged 75 should present no special problems of union because of age. From the wording of the question I take it that this is a fresh fracture rather than a non-union. Should it be an established non-union, again the administration of calcium in any form is of no benefit and operation would normally be indicated, though at the age of 75 there may be contraindications.

Continuous Penicillin Administration

Q.—*Is it possible that continuous administration of penicillin for five years, for preventing recurrences of rheumatic fever, may reduce the patient's natural resistance to other infections?*

A.—This question seems to presuppose that resistance to infection is maintained by repeated (and presumably sub-clinical) attacks; the prevention of these by continuous penicillin administration would then deprive the body of a "natural" stimulus. This is a supposition of which there is very little proof. In any case the dose usually given for the prophylaxis of rheumatic fever is too small to affect any but the most highly penicillin-sensitive bacteria: these, apart from haemolytic streptococci, are *Treponema pallidum*, pneumococci, meningococci, and some, but nowadays not all, gonococci. Most other bacteria and all viruses should still be able to carry out their natural functions, whether for good or ill.

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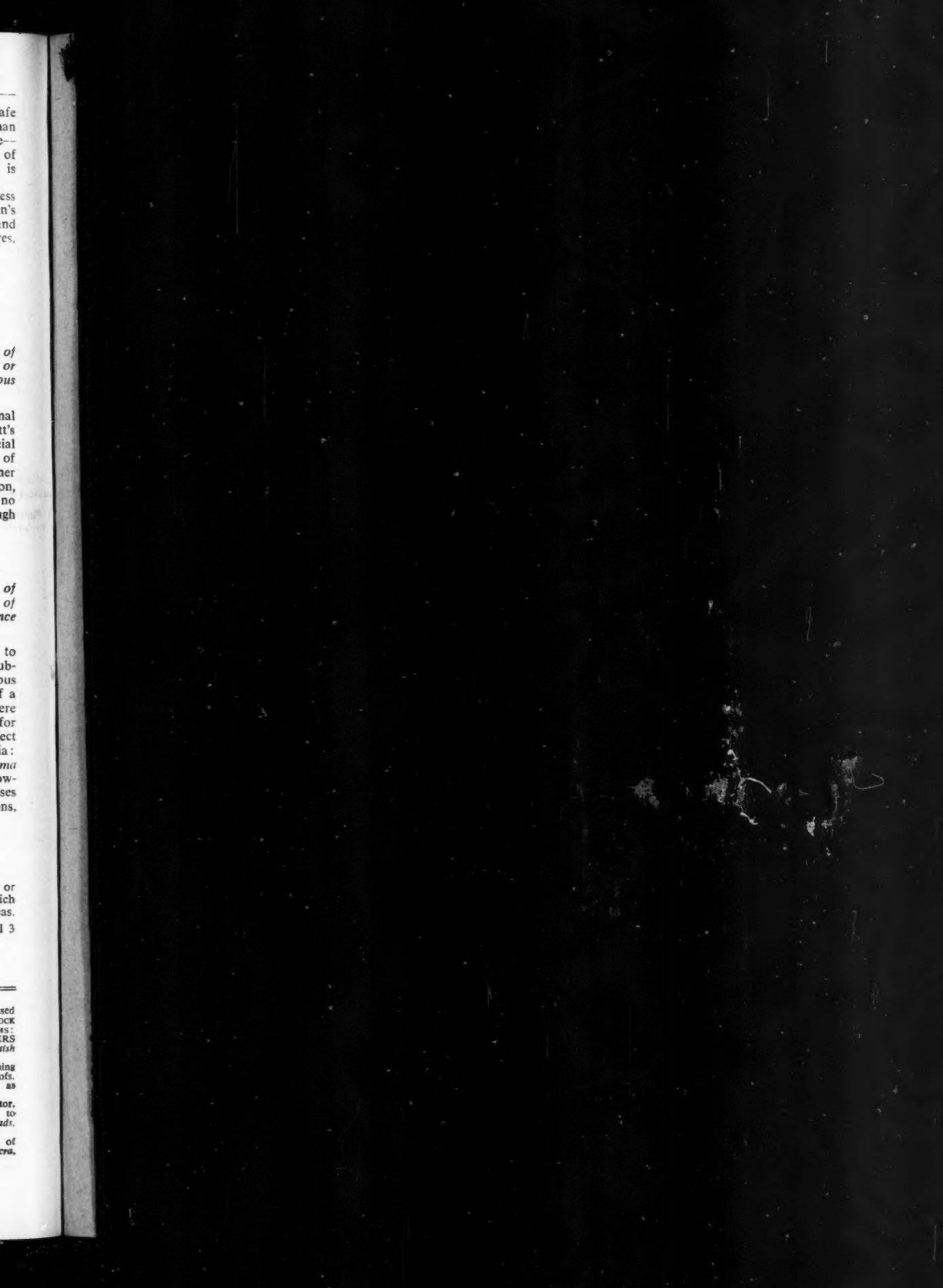
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